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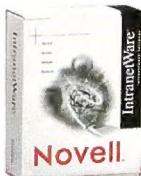


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NETWARE

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June 1998

The
Magazine for
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FEATURE

8 Exterminating the Millennium Bug Before It Wreaks Havoc on Your Company's Network

The millennium bug, which affects hardware and software that cannot correctly handle dates and date calculations in the year 2000, is not just hype: According to many year-2000 experts, the millennium bug is a disaster waiting to happen. Find out how you can avert this disaster.

22 Novell's Project 2000: Making Novell's Products Year 2000 Ready

Novell's Project 2000, a corporate-wide initiative designed to test Novell products for year 2000 readiness, is ensuring that these products will take your company's network safely into the 21st century.

24 Ask John Slitz

During the past few months, many of you have submitted marketing questions for John Slitz, senior vice president of Marketing at Novell. Find out what John has to say about Novell's marketing efforts.

28 Talking to Dell Computer's Mike Lambert

Dell Computer is quickly becoming one of the largest server and workstation vendors in the industry. In this interview, Mike Lambert, vice president at Dell, explains the secret of Dell's success.

NOVELL CERTIFIED PROFESSIONAL

30 Managing NetWare 3 and NetWare 4

If your company's network contains both NetWare 3 and NetWare 4 servers, managing both environments can be time consuming. This article explains how you can simplify network management by integrating the bindery and the Novell Directory Services Tree (NDS) tree.

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YEAR 2000 WEB SITES

If you read the article on page 8 of this issue, you will find a list of World-Wide Web sites that provide information about the year 2000 problem. However, this list does not mention one useful web site that we found as we went to press: the Year 2000 Support Centre, which offers resources for companies trying to exterminate the millennium bug.

To access this web site, go to the *NetWare Connection* home page, and click the Year 2000 Support Centre button. You can also click the Novell's Project 2000 button if you want to visit the Project 2000 web site, which explains how Novell is handling the year 2000 problem. (For more information about Project 2000, see the related article on p. 22.)

<http://www.novell.com/nwc>

NETWORK BASICS**35 Fax and E-mail Integration: Turning an E-mail System Into a Fax Solution**

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What if you install a switch to improve network performance and performance actually gets worse? Maybe installing a switch was the wrong solution. Mickey Applebaum explains how switches work and when you should use them to improve network performance.

38 Practical Networking: Resources at Your Fingertips

Where can you find a plethora of resources for managing your company's network? *NetWare Connection's* web site, of course. If you haven't visited this web site before or if you have only read articles online, you are missing out on a valuable tool.

48 Online Connection: That's Entertainment

With more movies being released each year and ticket prices rising all the time, you probably cannot afford to see every summer blockbuster. By visiting the web sites mentioned in this article, you can read movie reviews to help you decide which movies to see or not to see. You can also check out this month's network resources, games, and new products.

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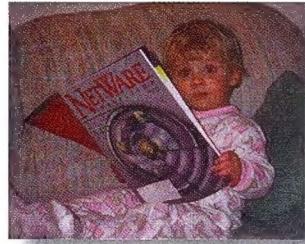


LETTERS TO THE EDITOR

One of Our Biggest (and Smallest) Fans

I recently took a photograph of my daughter, Emily, who is 19 months old. She likes to look at any book she can hold up. One afternoon, she grabbed my copy of *NetWare Connection*, which made for a Kodak moment. I would love to see this photograph in an upcoming issue of *NetWare Connection*.

Jerry Wendel



How could we resist printing such a darling photograph? Not only is Emily beautiful, but she also has great taste in magazines. We hope that she continues to enjoy NetWare Connection—and that she can actually read it someday!

Watching Our Figures

I have a question about the article "Gigabit Ethernet: Your Pipe Dream Come True?" (*NetWare Connection*, Apr. 1998, pp. 10–23). Figure 3 shows that a Fast Ethernet switch has been replaced by a Gigabit Ethernet switch. How can the 100 Mbit/s repeaters and the 10/100 Mbit/s switches communicate with the Gigabit Ethernet switch? Wouldn't you have to install a Fast Ethernet module in this switch or a Gigabit Ethernet module in each 100 Mbit/s repeater and 10/100 Mbit/s switch?

David Ding

I'm sorry for the confusion about Figure 3. You are correct: For this configuration, you would need to use a 100/1000 Mbit/s switch, or you would need to install a Gigabit Ethernet module in each 100 Mbit/s repeater and 10/100 Mbit/s switch.

Linda Boyer, author

Can Windows NT Take Advantage of Gigabit Ethernet?

I have a question about the article "Dr. Glenn Ricart: Novell's CTO Predicts How Gigabit Ethernet Will Change Networking" (*NetWare Connection*, Apr. 1998, pp. 26–27). In this article, Ricart states, "Novell alone needs Gigabit Ethernet; no other networking company has servers that can use more than 100 Mbit/s at this time." Can you explain this statement? For example, does Ricart mean that even though a server may have plenty of bandwidth, the server would not be able to deliver 100 Mbit/s if I migrated this server from NetWare to Windows NT?

Thank you for your help. I must admit that I eagerly look forward to each month's issue of *NetWare Connection*, which I usually read as soon as it hits my desk.

Jim Hannon

According to the tests I have conducted, only NetWare and UNIX servers are capable of filling up even a 10 Mbit/s connection. I typically receive throughput of 1 megabyte per second from my NetWare and UNIX servers, while I receive throughput of only 450 to 600 kilobytes per second from my Windows NT servers. Obviously, throughput may vary, but this test was conducted using three servers with identical configurations (a Pentium 233 MHz processor, a 9 GB UltraWide SCSI hard drive, and 128 MB of RAM).

Due to the fast throughput capabilities of NetWare and UNIX, I recommend using at least a 100 Mbit/s connection for NetWare and UNIX servers, and a Gigabit Ethernet connection can provide even better performance in these environments. For Windows NT servers, however, all you need is a 10 Mbit/s connection.

Matthew Jones, author

An Ideal Combination

I'm so confused! The article "Z.E.N.works Zeroes in on Workstations" (*NetWare Connection*, Apr. 1998, pp. 28–34) is intriguing, but according to the information in this article, Z.E.N.works seems to duplicate much of what Novell Application Launcher (NAL) does. Is Z.E.N.works replacing NAL, which I currently use? Also, do I need to purchase ManageWise if I want to use Z.E.N.works? Why is Novell developing two seemingly parallel paths for application distribution and management?

Larry Ritzert

Z.E.N.works relies on NAL as the application distribution and management component. Novell has simply evolved NAL and will continue to evolve it under the Z.E.N.works name.

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LETTERS TO THE EDITOR

Both NAL and Novell Workstation Manager (also a component of Z.E.N.works) will continue to be free, distributed as part of the Z.E.N.works Starter Pack. In addition to NAL and Novell Workstation Manager, the complete Z.E.N.works product offers remote control, help request, and hardware inventory capabilities—all of which are fully integrated with Novell Directory Services (NDS). Future versions of Z.E.N.works will also offer other capabilities, such as software metering.

We simply recognized that we had a number of products that fit into the desktop management arena, and we decided combining these products would enable us to distribute and market them more effectively. Although you do not need to purchase ManageWise to use Z.E.N.works, Z.E.N.works is the new desktop management product from Novell and will gradually replace the desktop management components of ManageWise.

Samm DiStasio, Z.E.N.works product marketing manager

NDS by Design

I just read the section "Letters to the Editor," which discusses the NDS design

used for COMDEX Intranet—Novell Connecting Points (NCP) (NetWare Connection, Mar. 1998, p. 4). This information could not have come at a better time. I am currently in the process of reviewing my company's NDS tree, which is basically flat (everything is under the [Root] object).

I am considering organizing the NDS tree by users and network resources, such as servers and printers. Because my company has only 60 employees and does not anticipate a major increase in staff, I think that this NDS design would work—or would it?

My alternate plan is to organize users and network resources by floor (we have users working on two floors). I think that this NDS design would also work because in my company, users on the same floor generally share network resources only with other users on that floor. In addition, users on the same floor tend to belong to the same department. However, this configuration doesn't apply to my company's two servers because all users need access to both of these servers.

I would really appreciate some recommendations about NDS design. Also, can you please explain what partitioning is and what benefits it provides? Maybe you can even suggest some resources that offer information about partitioning.

Tom Dailly

It sounds like you already have some good ideas about NDS design. An important element in NDS design is to keep the NDS tree manageable for you as a network administrator and functional for your company's users.

As your company expands, the NDS tree will gradually become more diversified. As a result, the NDS design you choose should be flexible enough to grow with your company. At this point, however, you should keep NDS design simple. For example, I recommend that you use only one or two Organizational Units (OUs). By keeping NDS design simple, you can create an NDS tree that meets your company's needs and is easy to manage.

Now to answer your question about partitioning: Partitioning is a way to distribute the NDS database at an OU level. Companies that have many users or many sites often find it beneficial to distribute portions of the NDS database across multiple servers. For example, you might create one partition containing users and network resources located at an office in Orlando and another partition containing users and network resources located at an office in Seattle. By partitioning the NDS database in this way and by distributing a replica of the appropriate partition to a server at each site, NDS can respond to authentication requests more quickly, and you can reduce WAN traffic.

For more information about NDS design, as well as about partitions and replicas, you can refer to any of the NDS design books that are available. You can also refer to the NetWare documentation, which contains some recommendations about NDS design.

Gary Norton, NCP systems architect

No, Thank You!

I just want to say thank you for the article "Technically Speaking: Network Printing Problems" (NetWare Connection, Feb. 1998, pp. 40–42). I had begun upgrading to intraNetWare and Windows 95, but I couldn't get printing to work consistently. Then I found this article, and now printing is working great. The article was clear and concise, and everything works exactly as you said.

Keep up the good work.
Ken Larson

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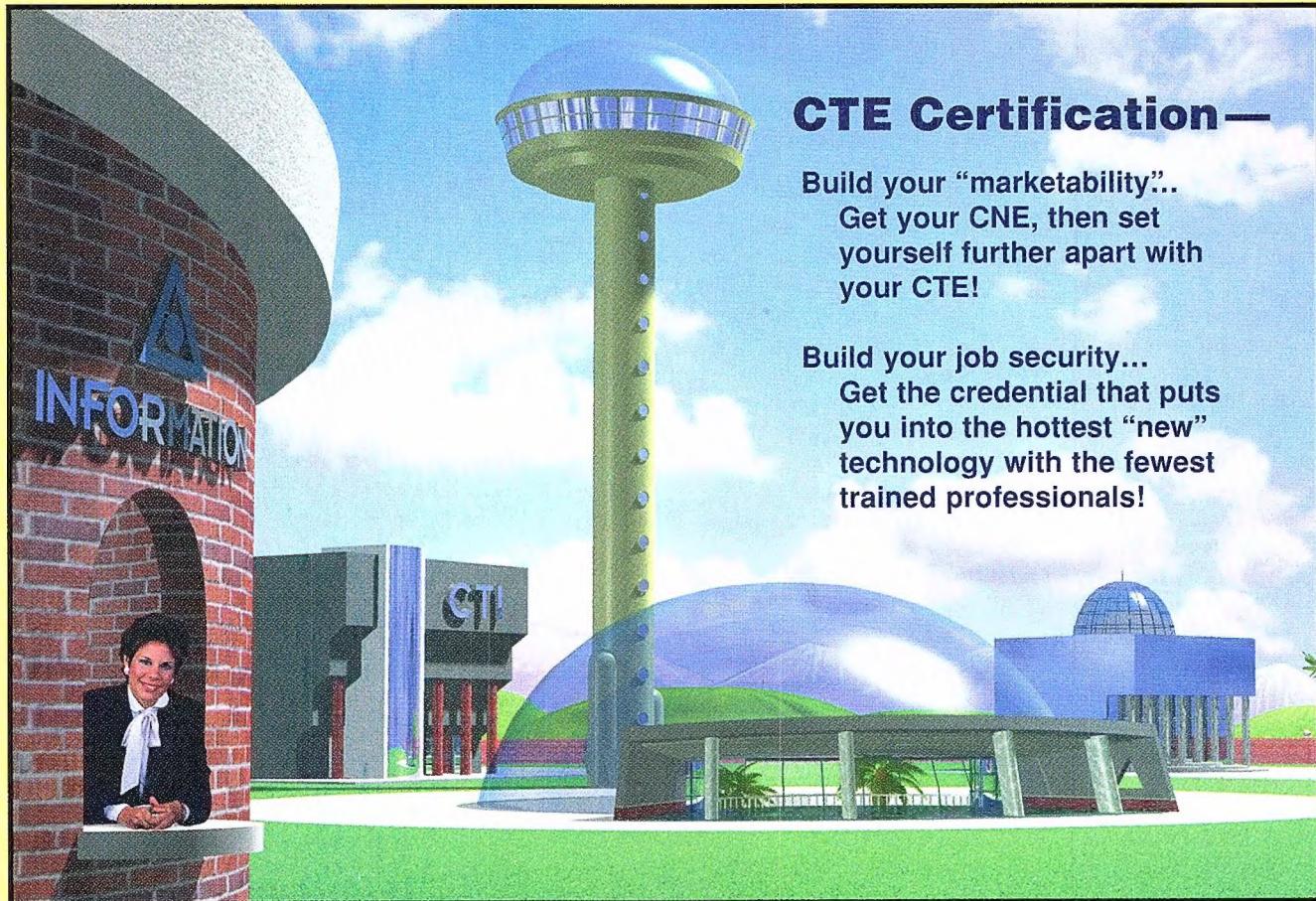
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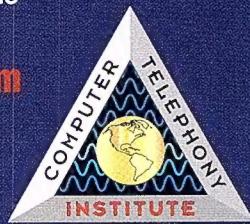
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Exterminating the Millennium Bug

Before It Wreaks Havoc on Your Company's Network

Linda Boyer

Unless you have been cut off from all sources of communication for the past several years, you have probably read or at least heard about the year 2000 problem, sometimes called the millennium bug. Reports about the year 2000 problem—what it is and what you should do about it—have appeared in both mainstream and computer publications since as early as 1991.

Of course, each publication views the year 2000 problem from a slightly different angle, but the source of this problem is the same: Most hardware and software use only two digits to indicate the year (98 rather than 1998, for example) and fail to recognize the digits 00 as the year 2000. As a result, many systems will miscalculate dates when the year 2000 arrives, and some of them will crash.

The year 2000 problem and its consequences might strike you as trivial, but you shouldn't be fooled: The year 2000 problem is significant, and fixing it—particularly in a network environment—can be surprisingly time consuming. So get to work and exterminate the millennium bug now. That way, you can celebrate when the clock strikes midnight on December 31, 1999—your company's network, unlike others, won't come to a screeching halt.

THE YEAR 2000 PROBLEM IS BUGGING EVERYONE

As a network administrator for a distributed PC-based network, you might be patting yourself on the back for getting rid of your company's mainframes. If so, you are probably under the common, but false, impression that the year 2000 problem is a mainframe problem. And you're wrong: The year 2000 problem can affect any system that uses date data, including mainframes, PCs, and embedded microprocessors that control security systems, call-processing systems, building climate systems, elevators, office equipment, and even fire alarms.

That said, the year 2000 problem arguably poses the biggest threat to companies that rely heavily on mainframes. Mainframe administrators who run mission-critical applications must sort through thousands of lines of code written in COBOL (a programming language for mainframes). In this haystack of code, mainframe administrators must find the proverbial needle—problem code. These administrators must then write and test new code to fix the year 2000 problem and integrate this code with the existing code. The entire process may cost anywhere



from U.S. 40 cents to U.S. \$1 per line of code. (See the answer to question 16 in IBM's year 2000 FAQ list at <http://www.ibm.com/year2000>. For a list of other year 2000 resources, see "Finding Out More" on p. 20.)

Finding problem code and writing, testing, and integrating new code require more work than many mainframe administrators can handle on their own. But COBOL isn't exactly a popular programming language anymore, so finding COBOL programmers who can help fix the year 2000 problem is difficult at best. COBOL programmers are in high demand these days, and companies are willing to pay a lot of money for their expertise. For example, one IS manager told *NetWare Connection* that a Texas-based educational institution is offering a bonus of U.S. \$10,000 to COBOL programmers who stay until the institution's year 2000 project is completed. The bonus is an attempt to keep other companies from luring the institution's programmers away.

ONE, TWO, THREE YEAR 2000 PROBLEMS

Although COBOL programmers will probably earn more money to exterminate the millennium bug, these programmers are looking for the same year 2000 problem that you should be looking for in the PCs, operating systems, applications, and data on your company's network. The year 2000 problem actually consists of several problems, including the fact that applications and data often use 99 in the year field to indicate special values (such as "no expiration date") and 00 to indicate an unknown year.

The following three problems are commonly associated with the year 2000 problem:

- The roll-over problem
- The two-digit problem
- The leap-year problem



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A Preparation Checklist

Most vendors insist that the success of a year 2000-ready product depends on the year 2000 readiness of all the products with which that product interacts. For example, Novell is testing the latest versions of most of its products to ensure that they are year 2000 ready. (See the related article on p. 22.) However, as John Canfield, Novell's year 2000 marketing manager, points out, these tests validate only that Novell products will not fail in a fixed, test network. But will Novell products work properly on your company's network?

Novell products will work properly if you ensure that the hardware and software with which these products interact are also year 2000 ready. "We can't possibly test every combination of our products running on every combination of hardware platforms to see if they're going to work properly," Canfield explains. In other words, you must ensure that Novell products work properly in your company's network.

To determine whether the hardware and software on your company's network is prepared for the year 2000, you should complete several basic steps:

PREPARING HARDWARE

- List the model and location of all the PCs on your company's network.
- Test PCs to ensure that the CMOS real-time clock (RTC) and the BIOS roll over to the year 2000 and retain the correct date when you reboot the PCs. (For more information about the CMOS RTC and the BIOS, see the "One, Two, Three Year 2000 Problems" section on p. 8 in the main article.)
- Contact hardware vendors of PCs that fail the roll-over test to determine whether upgrades are available.
- Upgrade or replace hardware as necessary.

PREPARING SOFTWARE

- Create a list of all software, such as operating systems and applications, on your company's network. (This list should include the software running on users' workstations.)
- Contact software vendors to determine which software is year 2000 ready and which software must be upgraded or replaced.
- Locate all PCs running software that you determine is not year 2000 ready.
- Upgrade or replace software as necessary. ☐

Roll Over (Good Boy!)

When the year 2000 arrives, some of the PCs on your company's network may experience problems unless you take action. In fact, Norbert Kriebel, an analyst with Giga Information Group, estimates that up to 70 percent of PCs might need help rolling over to the year 2000.

Specifically, each PC contains the following time-keeping devices, which might not recognize that the digits 00 indicate the year 2000:

- The CMOS real-time clock (RTC), also called the system clock
- The BIOS

The CMOS RTC, which keeps time whether the PC is on or off, notes the time, the date, and the last two digits of the year. The two digits representing the base century (that is, 19 for the base century 1900 and 20 for the base century 2000) are stored elsewhere. Specifically, the last two digits of the year are stored in CMOS address 9, and the first two digits that represent the base century are stored in CMOS address 50d. (See <http://www.y2kpcpro.com>, and click the Techno Babble button.)

The BIOS keeps time only when the PC is on. Unlike the CMOS RTC, the BIOS is not actually a clock—at least, not in the typical sense of the word. When you boot a PC, the BIOS retrieves the day of the month, the month, and the year

from the CMOS RTC, and then retrieves the century (from CMOS address 50d). The BIOS combines this data and translates it into the number of days since the PC's base date, which is January 1, 1980 for most IBM and IBM-compatible PCs.

From that point on, the BIOS simply counts the number of seconds that pass. The BIOS does not access the CMOS RTC again until you reboot the PC.

The CMOS RTC in each PC will probably roll over smoothly from 99 to 00. The BIOS might also seem to roll over smoothly because it is simply counting seconds and the difference between December 31, 1999, 23:59:59 and January 1, 2000, 00:00:00 is one tick. In PCs that are year 2000 ready, the BIOS will record the change in century to CMOS address 50d, where the two digits representing the base century are stored.

In PCs that are not year 2000 ready, however, the BIOS will not record the change in century to the century location. As a result, when you reboot one of these PCs, the BIOS will retrieve 00 as the year and 19 as the two digits representing the base century. When the BIOS appends 19 to 00, the four-digit year will appear as 1900. Because 1900 is an out-of-range year for most PCs, the BIOS will reset the date to January 1, 1980.

The Trouble With Two Digits

The two-digit problem, which is actually more of an application problem

than a hardware problem, is also year 2000 related. Many applications base date calculations on a two-digit year—either ignoring the century entirely or assuming that the two-digit year should always be preceded by 19. When you consider that the year 2000 ends with two zeros, it does not take long to realize that date calculations, which are fundamental to virtually every business computing process, are not going to work properly.

For example, in the year 2000, applications that use only a two-digit year in date calculations might determine that a person born in 1980 is negative 80 years old (00 minus 80 equals negative 80), rather than 20 years old (2000 minus 1980 equals 20). If these applications expected a positive value, they might simply ignore the negative (-) sign and save 80 as the value, making the two-digit problem even more difficult to find and fix. In addition, applications that sort data according to dates might sort these dates out of sequence, mistakenly assuming that the year 2000 (when represented as only 00) is earlier than the year 1999.

In fact, applications exhibiting the two-digit problem have already been discovered. For example, Lotus Development Corp. has disclosed that Release 5.1 and earlier versions of cc:Mail contain the two-digit problem. The source of this problem is DB6, a database that cc:Mail uses. Because DB6 records two-digit years, users' e-mail messages might be randomly

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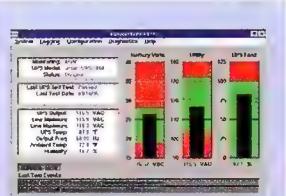
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Mission Impossible

As manager of Networking and Distributed Computing for the Dallas County Community College District (DCCCD), Steve Glick is concerned about preparing DCCCD's network for the year 2000. In fact, Glick has little time to finish a big year 2000 project.

Indirectly, DCCCD started preparing its network for the year 2000 about five years ago. In the fall of 1993, DCCCD began migrating mainframe applications to UNIX. Although DCCCD was aware that this plan would eliminate some major year 2000 issues, that wasn't the main reason for the plan. The main reason for migrating mainframe applications to UNIX was to form a single system that would integrate the disparate student, financial, and human resource systems.

Of course, Glick is relieved that when DCCCD finishes migrating mainframe applications to UNIX in the first quarter of 1999, DCCCD will also finish what is arguably the most expensive and time-consuming stage in a company's year 2000 project. If your company has mainframes but hasn't begun getting rid of mainframe applications, "you're in really bad shape," Glick says plainly. "In fact, you're too late."

Too late for what? Too late to move, remove, or repair all of your company's mainframe applications and thus solve the year 2000 problem before the year 2000 actually arrives. And if your company doesn't have mainframes but does have a distributed network to prepare for the year 2000, you better get to work—now. "This is the latest you can start," Glick warns, "without operating in absolute crisis mode."

The year 2000 project for DCCCD's metropolitan WAN actually started in March 1998. "We were expecting the year 2000 project to be time consuming," Glick explains, "and I think that's why we put it off as long as we did. The bad news is [the year 2000 project] is just as bad as we thought it would be."

deleted, and rules and sort commands involving dates might not work properly. (For more information about problems with earlier versions of cc:Mail, see <http://www.ccmail.com/overview/year2000>.)

Look Before You Leap

In addition to the roll-over problem and the two-digit problem, the leap-year problem may affect your company's network. This problem occurs because the year 1900 was not a leap year and the year 2000 is. As a result, hardware and software that interpret the digits 00 as the year 1900 will not handle dates properly.

Even hardware and software that support a four-digit year or interpret the digits 00 as the year 2000 might not recognize the year 2000 as a leap year. Hardware that doesn't recognize the year 2000 as a leap year will be unable to accept that the date February 29, 2000 exists, and you will be unable to reset the system clock (that is, the CMOS RTC) until March 1, 2000.

Software that doesn't recognize the year 2000 as a leap year will mishandle the following calculations:

- **Day-of-the-Week Calculations.** February 28, 2000 is a Monday, and March 1, 2000 is a Wednesday, not a Tuesday.
- **Day-of-the-Year Calculations.** The year 2000 has 366 days, not 365 days.
- **Week-of-the-Year Calculations.** The eleventh week of the year 2000 begins on March 13, not March 14.

As a result, software that doesn't recognize the year 2000 as a leap year will improperly handle dates. For example, this software will miscalculate the interest on loans that span this century and the next.

FINDING THE PROBLEMS

To exterminate the millennium bug, you will need to find the roll-over, two-digit, and leap-year problems on all of the hardware and software running on your

DCCCD's metropolitan WAN connects 11 sites using Asynchronous Transfer Mode (ATM). Collectively, these sites house approximately 125 NetWare servers (most of which are running NetWare 4.11), 12 Windows NT servers, two SPARC workstations, and more than 7,000 PCs. Although Glick knew about some free year 2000 testing utilities, including YMark2000 from National Software Testing Laboratories (NSTL), checking the hardware and software on these PCs sounded like an "overwhelming, if not impossible, task."

Fortunately, Glick found the application he needed to make the impossible, possible: BindView Enterprise Management System (EMS)/NETinventory from BindView Development Corp. NETinventory offers several features that are helping Glick find the year 2000 problem on DCCCD's hardware and software. For example, NETinventory enabled Glick to test the CMOS real-time clock (RTC) and the BIOS on each PC from a central location. To prevent you from having to travel to all PCs on your company's network, NETinventory sends an executable file to each PC.

This file, which takes about 30 seconds to run, launches automatically when a user logs in to the network from a particular PC. The file runs a year 2000 test, collects any pertinent data, and returns the results to NETinventory. Then "you just click your mouse once or twice, and you have a report on the year 2000 readiness of all inventoried PCs," Glick says. (For more information about NETinventory, see the "Testing, 1-2-3" section in the main article.)

Glick wants to finish the year 2000 project on DCCCD's metropolitan WAN within a year, but he knows that it will probably take more time before the entire project is completed. "Within four months," Glick says, "I want to identify all of the work we have to do and then spend the next eight months doing it." After that, Glick will test, test, and test again because "I want to be at a party on December 31, 1999—and feel good about being there." ☠

company's network. (For an overview of the tasks involved in exterminating the millennium bug, see "A Preparation Checklist" on p. 10.) To find these problems on your company's hardware, you can either contact the hardware vendor of each PC on the network, or you can test each PC on the network.

Who You Gonna Call?

You can contact hardware vendors by telephone or by mail, or you can visit the vendors' web sites. Most hardware vendors have posted information about whether or not their products are year 2000 ready.

For example, Gateway's web site includes a page dedicated to the year 2000 problem (<http://www.gateway.com/home/y2k/y2k>). This page explains that Gateway's Pentium-based PCs are year 2000 ready, which Gateway defines as PCs that roll over to the year 2000 and retain the correct date when you reboot them. Gateway's 486-based PCs, however, are not

year 2000 ready. These PCs will roll over to the year 2000 but will not retain the correct date when you reboot them.

Compaq's web site also includes a page dedicated to the year 2000 problem (<http://www.compaq.com/year2000>). This page mentions that Compaq PCs manufactured later than October 1997 are year 2000 ready. This page also includes a link to the web site for National Software Testing Laboratories (NSTL), which is testing current and past Compaq products.

Compaq admits that some of its PCs are not year 2000 ready. For many PCs, Compaq says, BIOS upgrades are available. However, BIOS upgrades are not available for all PCs, "so you may consider replacing them," Compaq advises.

Like Gateway and Compaq, Dell provides a year 2000 page on its web site (<http://www.dell.com/year2000>). In addition, Dell includes a "year 2000 warranty" at the end of its product descriptions. This warranty reads, "The internal mechanisms for handling system time and date functionality in Dell-branded systems will not be affected by and will accommodate

the rollover to the year 2000, and any date within the architected range of January 1, 1980 to December 31, 2079."

As Dell's year 2000 warranty implies, the BIOS in Dell PCs uses logic to determine the appropriate century. In other words, when you boot a Dell PC and the CMOS RTC contains any two-digit combination from 00 to 79, the BIOS assumes that the base century is 2000. When you boot a Dell PC and the CMOS RTC contains any two-digit combination from 80 to 99, the BIOS assumes that the base century is 1900. This type of logic, which is called *windowing*, is a common solution to the year 2000 problem that both hardware and software vendors use.

Contacting a hardware vendor and visiting its web site might yield important information, but you should not rely totally on this information. For example, when asked if you can trust hardware vendors' year 2000 statements, Kriebel says flatly, "No."

The trouble with hardware vendors, Kriebel explains, is that they each define *year 2000 ready* differently. In addition,

not all hardware vendors specify what they mean by *year 2000 ready*.

One fairly common definition is that a PC is *year 2000 ready* only if the PC rolls over smoothly to the year 2000 and retains the correct date when rebooted. "In my mind," says Kriebel, "that is truly *year 2000 ready*."

However, another equally acceptable definition exists: Some hardware vendors would have you believe that a PC is *year 2000 ready* as long as the PC rolls over smoothly to the year 2000—forget about what the PC does when you reboot it. As long as you can enter the correct date or upgrade the BIOS, these hardware vendors maintain, the PC is ready to face the next century. "I wouldn't trust your hardware vendor based only on an answer of *ready* or *not ready*," Kriebel says, "because *ready* can mean you have to do additional work to make the PC functional."

Testing, 1–2–3

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It's the End of the World as We Know It

How serious is the year 2000 problem? The statistics listed below should give you some idea of how much it will cost to fix the year 2000 problem and what will happen if the year 2000 problem goes unresolved.

THE COST OF FIXING THE YEAR 2000 PROBLEM

Although no one knows exactly how much it will cost to fix the year 2000 problem, there is no shortage of estimates. The following estimates are some of the more interesting estimates that I have found:

- The most widely quoted estimate is from the Gartner Group, a consulting company, which claims the cost will be at least \$300 billion worldwide.
- Officials at the U.S. Internal Revenue Service (IRS) announced that the agency expects to spend nearly \$850 million by the end of fiscal year 1999 on its year 2000 project. (See "Y2K Could Stall IRS Reforms," *TechWeb News*, Apr. 1, 1998. You can download this article from <http://www.techweb.com/wire/story/y2k/TWB19980401S0023>.)
- The Canadian Task Force 2000 estimates that fixing the year 2000 problem will cost Canadian businesses a total of \$12 billion. (See "A Call for Action: Report of Task Force 2000," Feb. 1998, p. 4. You can download this report from <http://strategis.ic.gc.ca/pics/yk/eng.pdf>.)

THE COST OF NOT FIXING THE YEAR 2000 PROBLEM

While the cost of fixing the year 2000 problem is high, the cost of not fixing this problem is potentially higher. Predictions for the consequences of not fixing the year 2000 problem range from relatively mundane to dire. For example, Greenwich Mean Time's World-Wide Web site (<http://www.gmt-2000.com/worst.html>) lists some interesting predictions. This site displays the types of headlines and articles that Greenwich Mean Time predicts you will see during the first few weeks of the year 2000.

Jesse Feiler and Barbara Butler, the coauthors of *Finding and Fixing Your Year 2000 Problem: A Guide for Small Businesses and Organizations* have a few of their own ideas about what will happen during the first few weeks of the year 2000. As the following

predictions show, Feiler and Butler, believe that the consequences of the unresolved year 2000 problem will be more of a nuisance than a catastrophe:

- Several incidents will affect a small number of people and that will probably go unreported. For example, at least one bank (hopefully a small one) may stop normal operations for a day or two. (See Feiler and Butler, *Finding and Fixing Your Year 2000 Problem: A Guide for Small Businesses and Organizations*, p. 9, AP Professional, 1998.)
- A few large incidents will attract international attention. For example, while most elevators with embedded microprocessors will work just fine, if even one elevator fails, the news will probably report that failure. (See Feiler and Butler, p. 9.)

In an April 6 interview with *Forbes ASAP*, Grenfell Edward Yardeni, chief economist at Deutsche Morgan, said, "The year 2000 problem could lead to a very nasty recession. Just the way a disruption in the supply of oil caused a global recession, a disruption in the flow of information might similarly disrupt global economic activity and produce a recession."

Of course, the economy will not be the only thing affected by the year 2000 problem. Peter de Jager, a year 2000 consultant, claims to have received some disturbing information during his seven years of experience working on year 2000 problems. (See Peter de Jager's web site at <http://www.year2000.com>.) For example, de Jager says the following problems could occur if certain companies do not solve their year 2000 problem:

- Explosions involving chlorine gas will occur at an unidentified chemical plant if a particular embedded microprocessor with the year 2000 problem is not repaired.
- An unidentified airline plans to suspend flights from December 31, 1999 to the second week in the year 2000 due to the year 2000 problem.
- A list of medical devices and their model numbers describes how they will fail in the year 2000.
- A large manufacturer has confessed that some of its embedded microprocessors will fail in the year 2000. The decision about whether to inform customers of that fact has been left to the marketing department. ☐

year 2000 is to test each PC. The good news is that several automated testing utilities are available—many of which are free. (See "Year 2000 Testing Utilities" on p. 19.) Test2000 from The RightTime Company, for example, is a free year 2000 testing utility for standalone PCs. (You can download this utility from RightTime's web site at <http://www.rightime.com>.)

On its web site, RightTime claims that the "hardware problem is not as complicated as other testing programs suggest." Apparently, this claim explains why Test2000 performs only two tests: a test to see if the BIOS rolls over in real time to the year 2000, and a test to see if the

BIOS retains the correct date when you reboot the PC. Test2000 does not test the CMOS RTC because most operating systems and applications get their time from the BIOS.

Other testing utilities, such as NSTL's YMark2000, test both the CMOS RTC and the BIOS. NSTL explains that some operating systems base their time on the CMOS RTC rather than on the BIOS, so NSTL considers it essential to test both time-keeping devices.

Of course, if your company has hundreds of PCs, the prospect of testing each PC might be overwhelming. But take heart: You can use a year 2000 testing

utility to simultaneously test all of the PCs attached to a particular server.

For example, Check 2000 Client/Server from Greenwich Mean Time audits networked PCs to identify the year 2000 problem. Check 2000 Client/Server purportedly takes only a few minutes to scan each PC, which is "dramatically faster than a manual audit and certainly more accurate and coherent," according to Greenwich Mean Time. (For more information about Check 2000 Client/Server, visit <http://www.gmt-2000.com>.)

Another utility for testing networked PCs is BindView Enterprise Management System (EMS)/NETInventory from Bind-

View Development Corp. Like Check 2000 Client/Server, NETInventory audits the hardware and software on networked PCs to identify the year 2000 problem. BindView claims that NETInventory takes only 30 seconds to scan each PC.

NETInventory tests the CMOS RTC and the BIOS to determine if these time-keeping devices roll over to the year 2000 and if they recognize the year 2000 as a leap year. Neither Check 2000 Client/Server nor NETInventory perform a reboot test, which BindView claims is unnecessary. (For more information about the roll-over test and the reboot test, see "Is the Roll-Over Test Enough?" on p. 12.)

Year 2000 testing utilities such as Check 2000 Client/Server and NETInventory can save you a lot of time. In fact, suppose that everyone on a 100-user network logged in at approximately the same time. If you ran NETInventory at this time, you could receive a complete report within approximately the length of time it took everyone to log in.

For network administrators like Steve Glick, NETInventory has "taken a daunt-

ing task and made it manageable. Actually," Glick says, "NETInventory has made the task possible." Glick is manager of Networking and Distributed Computing for Dallas County Community College District (DCCCD). DCCCD's metropolitan WAN uses Asynchronous Transfer Mode (ATM) to connect 11 sites that collectively house more than 7,000 PCs. (For more information about Glick's approach to the year 2000 problem, see "Mission Impossible" on p. 12.)

Year 2000 testing utilities such as Check 2000 Client/Server and NETInventory can also save you money. If you had to individually test all of the PCs on your company's network, you might be unable to handle this job alone. But if you had to hire a consultant to help test these PCs, you might pay as much as U.S. \$60 per PC, according to Dan Hurley, product marketing manager at BindView. "And consultants' fees are rising."

In contrast, Check 2000 Client/Server costs U.S. \$350 for a five-user license, and NETInventory costs U.S. \$17.75 per node. However, to use NETInventory at

all, you must first purchase a BindView EMS console and then NETInventory. "What you buy with NETInventory," Hurley explains, "is the license to audit a node. The BindView EMS console enables you to view that information, change it, and report on it."

FIXING THE PROBLEMS

Whatever approach you use to find PCs that are not year 2000 ready, once you have found these PCs, you must fix them by using one of several methods. The method you choose depends on the extent to which the PC is not year 2000 ready. You can use one of the following methods to fix PCs that are not year 2000 ready:

• Manually Reset the System Clock.

Some PCs that will not retain the correct date when you reboot them in the year 2000 might need to have their system clock reset. Gateway's 486-based PCs, for example, will not retain the correct date when you reboot them in the year 2000. On its web site, Gateway

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Is the Roll-Over Test Enough?

Like many year 2000 testing utilities, BindView Enterprise Management System (EMS)/NETInventory from BindView Development Corp. conducts a roll-over test to determine whether a PC is year 2000 ready. (For more information about NETInventory, see the "Testing, 1-2-3" section on p. 13 in the main article.) That is, NETInventory resets the CMOS real-time clock (RTC), or system clock, to a few seconds before January 1, 2000, 00:00:00 and monitors both the CMOS RTC and the BIOS to ensure that they make the transition. However, unlike some other year 2000 testing utilities, NETInventory does not ensure that the PC maintains the correct date when you reboot it. So is the roll-over test alone sufficient?

A PC will retain the correct date upon reboot as long as the BIOS records the change in century to the century location in the CMOS RTC when the PC rolls over from the year 1999 to the year 2000. There are two methods to determine whether the BIOS has recorded the change in century:

- Set the system clock to seconds before the transition, watch in real time as the PC rolls over, wait a few moments, and reboot the PC.
- Use a utility to view the CMOS RTC after the transition and see for yourself whether the BIOS has recorded the change in century. (NETInventory uses this method.)

explains how to use the DOS date command to manually reset a PC's system clock. After you manually reset the system clock, the PC will retain the correct date upon reboot.

Upgrade the BIOS. You might manually reset a PC's system clock, only to find that the PC still displays the incorrect date upon reboot. In this case, you can upgrade the BIOS if a BIOS upgrade is available. According to Kriebel, of the 70 percent of PCs that are not year 2000 ready, the vast majority are recoverable: If you manually reset the system clock or upgrade the BIOS, these PCs will work properly when the year 2000 arrives.

Some hardware vendors offer patches if a BIOS upgrade is not available for these vendors' PCs. For example, you cannot upgrade the BIOS of some Dell PCs manufactured before 1995. For these PCs, Dell offers a patch that you can insert in the CONFIG.SYS file.

Another alternative to manually resetting a PC's system clock or upgrading the BIOS is to run a utility that resets the system clock for you. For example, Y2KPCPro from RightTime is a small program designed to help PCs roll over to the year 2000. RightTime claims that if you run the Y2KPCPro utility,

Norbert Kriebel, an analyst at Giga Information Group, believes that actually rebooting a PC is the only way to ensure that it will retain the correct date. According to Kriebel, simply viewing the CMOS RTC to determine whether the BIOS has recorded the change in century is conducting a test in an "unnatural environment." Under these circumstances, Kriebel suggests, you are determining whether a PC will retain the correct date by "looking through the BIOS, which is in a stable state"—a state that is not a fair representation of the state of the PC when you reboot it. Although viewing the CMOS RTC is useful, Kriebel says, "it leaves a risk factor. You can't really be sure of what's going to happen when you reboot the PC." Will the PC retain the correct date?

Dan Hurley, product marketing manager at BindView, insists that the PC will retain the correct date: If the BIOS has recorded the change in century, the PC will retain the correct date upon reboot. Although BindView considered including a reboot test in NETInventory to confirm that the PC retained the correct date, BindView ultimately decided that the reboot test was unnecessary. "It is conceivable," Hurley allows, "but unlikely that a BIOS reporting the correct date during a roll-over test will report an incorrect date in a reboot test."

BindView, Hurley reports, has encountered no cases of disagreement between a roll-over test and a reboot test. In any event, Hurley maintains, "a failure to retain century information upon reboot would more likely indicate a battery failure than a problem with the CMOS RTC or the BIOS." ☀

upgrading the BIOS "will usually not be necessary." (For more information about Y2KPCPro, visit RightTime's web site at <http://www.righttime.com>.)

- **Replace the PC.** A few of the PCs on your company's network—maybe 1 or 2 percent, Kriebel says—might be "completely trashed." Some PCs will not retain the correct date when you reboot them no matter how many times you manually reset the system clock, and some PCs contain programmable-only memory (PROM) chips, which you cannot upgrade. You will probably have to replace these PCs.

You might be wondering why you have to check every PC on your company's network, including workstations. After all, if you configure workstations to synchronize their system clock with the server's system clock, why should you care whether these workstations are afflicted with the year 2000 problem, as long as you ensure that the server's system clock is correct?

There are several reasons you should care if workstations are year 2000 ready:

- NetWare synchronizes a workstation's BIOS—not the CMOS RTC—with the server's system clock. And while

most operating systems and applications get the date and time from the BIOS, some software gets the date and time from the CMOS RTC.

- If a workstation cannot handle dates past the year 1999, the workstation's system clock will be unable to synchronize with the server's system clock.
- If the network goes down, many users will continue to work with local software, which may corrupt date data.

Companies that are hoping to solve the year 2000 problem by configuring workstations to synchronize their system clock with the server's system clock "are sitting on a ticking bomb," Hurley explains. Without checking every PC on your company's network, Hurley adds, "you can't possibly know whether or not each PC will retain the correct date."

CHECKING SOFTWARE

Unlike hardware, which you can test for year 2000 readiness, software leaves you little choice but to contact or check the web site of every vendor of every operating system and application on your company's network. (See "Getting Information About Software" on p. 20.) NETInventory simplifies this task by including

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Ready to Get to Work?

Novell encourages all companies to develop a plan to assess critical operations in all areas of the enterprise—not just the IT area. The basic steps involved in an enterprise-wide year 2000 project are listed below.

ASSESS CRITICAL OPERATIONS

- Make a list of all systems in your company that might be afflicted with the year 2000 problem. In addition to testing workstations, servers, mainframes, routers and hubs, you should look outside of the IT area, cautions John Canfield, Novell's year 2000 marketing manager. "You need to consider your company's entire infrastructure," Canfield says. For example, you should check any systems that might contain embedded microprocessors, such as security systems, building climate systems, and call-processing systems.
- While fixing the year 2000 problem on individual systems isn't a *technical* challenge, fixing this problem throughout the enterprise can be a *management* nightmare. As a result, you might want to hire someone specifically to manage your company's year 2000 project or, at the very least, make an existing employee year 2000 project manager.
- Contact hardware and software vendors. (For more information about contacting hardware and software vendors, see the "Who You Gonna Call?" section on p. 12 in the main article.)

a mail merge utility that enables you to quickly create hundreds of contact letters for the vendors of operating systems and applications NETInventory detects on your company's network. Currently, NETinventory can detect more than 4,000 operating systems and applications.

Like hardware vendors, most software vendors post information about the year 2000 problem on their web site, and some of these web sites are more informative than others. For example, the year 2000 page on Novell's web site is extremely helpful (<http://www.novell.com/p2000>). This page offers extensive information about the year 2000 problem in general, a FAQ list regarding Novell's approach to the year 2000 problem, and the criteria Novell is using to test the year 2000 readiness of its products.

Novell's year 2000 page also offers a white paper on Novell's Project 2000, which is the name of Novell's effort to ensure that its products and its own network are year 2000 ready. As part of Novell's Project 2000, this page includes a table that lists all Novell products and indicates whether these products are year 2000 ready. (For more information about Novell's Project 2000, see the related article on p. 22.)

- Conduct year 2000 testing on your company's systems. (For more information about year 2000 testing, see the "Testing, 1-2-3" section on p. 13 in the main article.)
- Estimate the cost of fixing the year 2000 problem on your company's systems.
- Even if you can afford to repair every system, you probably don't have enough time to repair all of them before the year 2000 arrives. So repair critical systems first, and plan to create backups of noncritical systems (the ones that won't be year 2000 ready).

IMPLEMENT YEAR 2000 SOLUTIONS

- Upgrade or replace hardware.
- Upgrade off-the-shelf applications.
- Modify code for in-house applications.
- Change two-digit dates wherever necessary.

TEST YEAR 2000 SOLUTIONS

- Once you have implemented year 2000 solutions, you should test your company's systems again to see if they work properly when you set the date to the year 2000. According to Fay Lim, marketing communications manager at Data Dimensions Inc. (DDI), the testing phase of a year 2000 project is more time consuming than the other phases. Lim says you should plan to spend 45 to 50 percent of the total time you devote to your company's year 2000 project on the testing phase alone. ☐

The latest versions of most Novell products will take you safely into the year 2000. Like other software vendors, however, Novell's extensive testing has confirmed that its products will work properly in the year 2000 only if you are running these products on year-2000 ready hardware and with year-2000 ready software.

Of course, not every software vendor makes finding year 2000 information as easy as Novell does. For example, finding year 2000 information about Quicken from Intuit Inc. is difficult. First, you must locate the product support page (<http://www.intuit.com/support/quicken>). You must then select a specific version of Quicken from the Browse field, which displays a menu containing categories of questions and answers. Finally, you must guess which category contains a question and answer about the year 2000 problem.

For example, the question and answer about the year 2000 problem in Quicken 98 for Windows is located in the Program Capabilities section in the General/Non-Technical category. The answer to the last question in this section explains that Quicken 98 for Windows applies logic to users' two-digit date entries. As a result, Quicken 98 for Windows recognizes any two-digit combination from 00 to 27 as

belonging to the base century 2000. In addition, Quicken 98 for Windows supports four-digit date entries in fields designating the year.

Finding year 2000 information on Lotus' web site isn't easy either. In fact, you can find year 2000 information for most Lotus products only by selecting the Search option from the home page (<http://www.lotus.com>) and entering Year 2000 in the Search field. This search yields links to countless articles that explain how the year 2000 problem will impact Lotus products, such as Notes.

For example, the article "Lotus and the Year 2000: A Perspective" states that all versions of Notes "fully support all year 2000 date functions and no human intervention will be necessary for Notes to continue functioning correctly when we move into the year 2000." In other words, all versions of Notes accept four-digit date entries.

As you read on, however, you discover a catch: Users have the option of entering two digits rather than four digits for the year. When users enter only two digits for the year in Notes 4.5 and above, Notes applies logic to determine the appropriate century, so no problem occurs. On the other hand, previous versions of

Year 2000 Testing Utilities

Product Name	Company Name and World-Wide Web Site	Type of Product	Free?
BindView EMS/NETinventory	BindView Development Corp. http://www.bindview.com	Client-server	No
Check 2000 Client/Server	Greenwich Mean Time http://www.gmt-2000.com	Client-server	No
Check 2000 PC	Greenwich Mean Time http://www.gmt-2000.com	Standalone	No
Test2000	The RightTime Company http://www.rightime.com	Standalone	Yes
YMark2000	National Software Testing Laboratories (NSTL) http://www.nstl.com/html/ymark_2000.html	Standalone	Yes

Notes always assume that the base century is 1900 when users enter only two digits for the year.

While this problem is easy to avoid (simply by educating users to enter four digits for the year), you may not have considered this problem if you had not found and read this particular article. The year 2000 information on Lotus' web site raises an important point: Carefully read all software vendors' year 2000 information from beginning to end to ensure that you do not overlook small but critical details.

DON'T SIT BACK AND RELAX YET

If the task of fixing the year 2000 problem is so odious—and expensive—why bother? The specific answer to that question depends on several things, including who you ask, what type of systems you're talking about, and what type of business your company's network supports. But the general answer is that you need to bother because of the direct and indirect consequences of not fixing the year 2000 problem.

As mentioned earlier, the direct consequences are that if you don't fix the year 2000 problem, many of your company's systems will miscalculate dates, and some of these systems will crash. Everyone who is most familiar with the year 2000 problem—year 2000 solutions vendors, consultants, analysts, and IS managers who have launched a year 2000 project—agrees on that fact.

What everyone doesn't necessarily agree on are the implications of that fact—the indirect consequences of systems all over the world failing to work properly at roughly the same time. Even

if only a few failures occur, how will these failures impact your company, other companies, and the global economy? Predictions about the impact of the year 2000 problem range from the suggestion that all of us will suffer a series of relatively minor inconveniences to the threat of a global recession. (See "It's the End of the World as We Know It" on p. 14.)

Nevertheless, the "why bother?" sentiment might account for the number of companies that have not yet started to address the year 2000 problem. In fact, statistics show that not enough companies are taking the matter seriously.

The Gartner Group, a consulting company that advises nearly 12,000 clients about the year 2000 problem, surveyed 2,300 companies in 17 countries and found that nearly 30 percent of these companies had not started to address the year 2000 problem. (See "Squashing the Millennium Bug," *The Orlando Business Journal*, Mar. 16, 1998. You can download this article from <http://www.amcity.com/orlando/stories/031698/focus1.html>.)

In addition, the Canadian Task Force 2000 conducted a survey and found that while the vast majority of Canadian companies are aware of the year 2000 problem, only 46 percent of these companies have taken steps toward fixing this problem. (See "A Call for Action: Report of Task Force 2000," Feb. 1998, p. 4. You can download this report from <http://strategis.ic.gc.ca/pics/yk/eng.pdf>.)

YOU'VE GOT TWO YEARS— WHAT'S THE RUSH?

Perhaps the network administrators of companies that haven't started to address the year 2000 problem are thinking, "I've

got two years. What's the rush?" First, you now have only eighteen months—not two full years. And second, anyone who knows anything about the year 2000 problem knows that if you want to fix this problem before the end of the century, you'd better start now because you're running out of time. In fact, some people would argue that you're out of time already.

The *Irish Times* recently reported that companies that started addressing the year 2000 problem as early as April 1997 will have only 60 percent of their systems year 2000 ready by January 1, 2000. (See "Firms Slow to Act as Computer Chaos Looms," *Irish Times*, Apr. 3, 1998. You can download this article from <http://www.irish-times.com/irish%2Dtimes/paper/1998/0403/tech1.html>.) Hurley shares this sentiment but offers a different statistic: Although Hurley claims that companies in North America are leading the way in terms of fixing the year 2000 problem, he believes that even the companies ahead of the year 2000 game will probably fail to prepare about 30 percent of their systems. "That's a scary prophecy," Hurley adds.

How much time do you need? According to Fay Lim, about two years, depending of course on the size of your company's network. Lim is marketing communications manager at Data Dimensions Inc. (DDI), a consulting company that has been in the year 2000 business since 1991. (For more information about the basic steps involved in a year 2000 project, see "Ready to Get to Work?" on p. 18.)

As Lim points out, you no longer have two years, so DDI is advising its clients to "think in triage mode." In other words, you should work with a year 2000

Finding Out More

World-Wide Web Site

<http://www.novell.com/p2000>

Description

In addition to providing information about the year 2000 readiness of Novell products, this web site offers a white paper on Novell's Project 2000, which includes a brief but clear explanation of the year 2000 problem. This web site also provides links to other year 2000-related web sites.

<http://www.ibm.com/year2000>

In addition to providing information about the year 2000 readiness of IBM products, this web site allows you to download an informative book called *The Year 2000 and 2-Digit Dates*. The book, which is targeted at IS managers, computer programmers, and corporate executives, explains the sources of the year 2000 problem and offers different approaches for fixing this problem.

<http://www.year2000.com>

This web site, which is developed by year-2000 consultant Peter de Jager, includes several hyperbolic statements about the effects of the year 2000 problem. This web site also includes links to virtually every company that offers year 2000 solutions.

http://www.mitre.org/research/cots/COMPLIANCE_CAT.html

This web site lists some of the known problems with commercial hardware and software products that are not year 2000 ready.

<http://www.mitre.org/research/y2k/docs/VENDORS.html>

This web site lists companies that offer year-2000 consultant services or products for fixing the year 2000 problem.

<http://www.netscapeworld.com/netscapeworld/nw-12-1996/nw-12-year2000.html>

This web site explains the three basic steps that web masters and web developers should take to determine the extent of their year 2000 problem.

<http://www.y2klinks.com/default.htm>

This web site provides links to other year 2000 sites and also provides test results and opinions about software and hardware that might help solve your company's year 2000 problem. ☐

consultant or with your company's own year 2000 team to determine which systems are mission critical. Then start finding and fixing the year 2000 problem on these systems "just to keep yourself in business," Lim explains. As for the remaining systems, prepare backups and hope for the best.

CONCLUSION

Although finding the year 2000 problem on your company's network is not difficult, contacting hardware and software vendors, testing hundreds of PCs, upgrading the BIOS in even a few of them, and upgrading software takes time—a lot of time. In fact, if you want to spend Decem-

ber 31, 1999 at a party rather than at work, you'd better get started immediately. "If you aren't working on the year 2000 problem now," Glick cautions IS managers everywhere, "what are you doing after lunch? It's time to start."

Linda Boyer works for Niche Associates, which specializes in technical writing. ☐

Getting Information About Software

Company Name

World-Wide Web Site

Adobe Systems Inc.

<http://www.adobe.com/supportservice/custsupport/NOTES/227e.htm>

Corel Corp.

<http://www.corel.com/2000.htm>

Lotus Development Corp.

<http://www.lotus.com> (Select the Search option and enter Year 2000 in the Search field.)

Microsoft Corp.

<http://www.microsoft.com/ithome/topics/year2k>

Novell Inc.

<http://www.novell.com/p2000>

Intuit Inc.

<http://www.intuit.com/support/quicken> (Select the appropriate product in the Browse field and scan the General/Non-Technical questions list.) ☐



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Novell's Project 2000

Making Novell's Products Year 2000 Ready

Linda Boyer

As a network administrator, you will be relieved to learn Novell has validated that the latest versions of most of its products are year 2000 ready. According to John Canfield, Novell's year 2000 marketing manager, this validation is the result of a corporate-wide effort known as Project 2000. Begun in 1996, Project 2000 is designed to test and verify that Novell products (and Novell's internal systems) are year 2000 ready.

Interestingly enough, when Project 2000 began, Novell engineers claimed that the core NetWare operating system contained no year 2000 problems—a claim that Project 2000 substantiated. Canfield explains, "After almost two years of thorough product testing, Project 2000 has found no year 2000 problems in the core NetWare operating system shipping today that would cause a NetWare network to fail."

The premise behind Project 2000 is that customers have to know with certainty how Novell products will handle the change in century. (For more information about the year 2000 issue, see the related article on p. 8.) When customers approach Novell with questions about the year 2000 status of its products, these customers "need more than just a nod and a pat on the back," Canfield says.

To give customers peace of mind, Novell formed Project 2000 and added year 2000 requirements to the YES program. These requirements verify that third-party products participating in Novell's YES program will not cause year 2000 problems in the core NetWare operating system. (Novell has created a Project 2000 World-Wide Web site at <http://www.novell.com/p2000>.)

WHAT DOES NOVELL MEAN BY YEAR 2000 READY?

Novell defines year 2000 ready as "the ability of software products to accurately process date data from, into, and beyond the years 1999 and 2001, including leap-year calculations, when used in accordance with product documentation." (See question 1 at <http://www.novell.com/p2000/qa.html>.) As a basis for product testing, Novell developed 10 criteria for a year 2000-ready product. (For a complete list of these criteria, visit <http://www.novell.com/p2000/criteria.html>.)

For example, Novell specifies that a year 2000-ready product can correctly display dates up to the year 2035, correctly



calculate the day of the week for all dates between 1980 and 2035, and correctly recognize the year 2000 as a leap year. Although selecting the year 2035 was more or less arbitrary, according to Canfield, Novell selected the year 1980 because January 1, 1980 is the base date for most IBM and IBM-compatible PCs.

Novell's year 2000 stamp of approval does not mean, however, that your company's entire network environment will operate properly when the year 2000 arrives. Novell products (like any vendor's products) are only as good as the third-party products they work with. In other words, Novell products deemed year 2000 ready will correctly handle dates and date calculations when the hardware and software you use are also year 2000 ready. (See question 1 at <http://www.novell.com/p2000/qa.html>.)

WHICH PRODUCTS ARE YEAR 2000 READY—AND WHAT TO DO WITH ONES THAT AREN'T

Novell has already tested most of its products for year 2000 readiness and has posted the test results on the Project 2000 web site. (To view these test results, visit <http://www.novell.com/p2000/product.html#intraNetWare/NetWare Platforms>.) For example, Novell has tested NetWare 4.11 and NetWare 3.2 and has validated that these products are year 2000 ready. NetWare 5 will be year 2000 ready out of the box because Novell incorporated year 2000 requirements during the development of this product.

The Project 2000 web site includes a table listing all Novell products and the year 2000 status of these products. (For example, you can find out if a product is year 2000 ready, if Novell has completed its testing, or if the product is not being tested.) In addition, the table includes hypertext links to year 2000 updates and to README files that explain the problems resolved by these updates.

For some of its year 2000-ready products, Novell is providing optional year 2000 updates. These updates "are not critical to the functioning of the operating system," Canfield explains.

"Most of the problems we found are display issues for which we have released the updates."

For example, in the MENU.OVL program located in the SYS\PUBLIC directory on an intraNetWare or NetWare 4.11 server, the Logged in Since date is incorrectly displayed. This problem, according to Canfield, will not cause the server to crash or to incorrectly process date data. "It's a display issue only," Canfield explains, "not a processing problem in the program logic."

Other Novell products that have been tested for year 2000 readiness, including NetWare 3.12, contain year 2000 problems that are more serious. For these products, Novell recommends either upgrading to a more recent version or applying the year 2000 updates available on the Project 2000 web site.

For example, depending on the hardware you are using, the LOADER.EXE program located in the BOOT directory on a NetWare 3.12 server might fail to roll over to the year 2000. The year 2000 updates for NetWare 3.12 fix this and other year 2000 problems. Prior to applying the year 2000 updates for any Novell product, however, you must apply all previous updates available for the product. (For more information about applying the year 2000 updates for NetWare 3.12, see the README file that is posted with these updates.)

Novell does not plan to test all versions of its products. In most cases, Canfield explains, "We have tested the latest versions of our products. Not all versions will be tested or supported for year 2000 problems." If you use an older version of some Novell products, you must upgrade to ensure that your company's network is year 2000 ready. For example, Novell will not test NetWare 4.1, NetWare 3.11 and earlier versions of NetWare. If you are using these versions, Novell recommends that you upgrade to the latest version.

IS YOUR COMPANY'S NETWORK YEAR 2000 READY?

Although Novell has done and continues to do thorough product testing, you must still ensure that Novell products will work in your company's unique network environment. "I think it's the responsibility of everyone in the IT industry to check everything on his or her own network," Canfield says.

Through Project 2000, Novell has validated that its products will not fail in a fixed, test network. However, Novell "cannot test every possible configuration of its products running on every possible combination of hardware to see if they are going to work properly," Canfield points out.

So the bottom line is this: Novell has validated that the latest versions of most

of its products are year 2000 ready. Will these same products operate properly on your company's network? Only you can answer this question by ensuring that all of the hardware and software you use is year 2000 ready.

Linda Boyer works for Niche Associates, an agency that specializes in technical writing and editing. Niche Associates is based in Salt Lake City, Utah. •



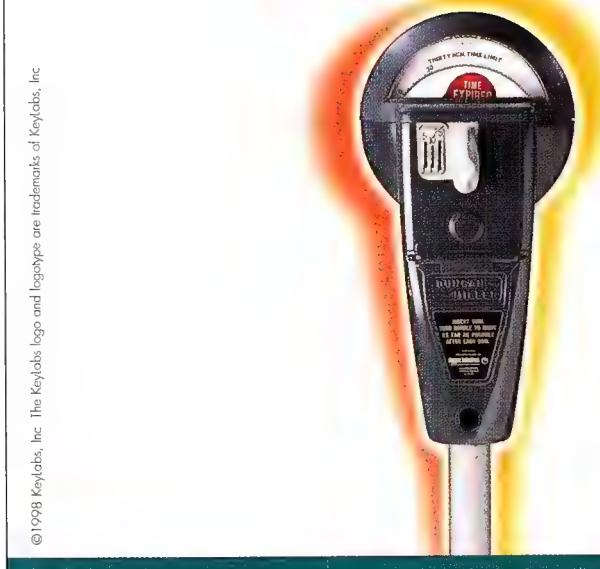
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Ask John Slitz

Since John Slitz, senior vice president of Marketing at Novell Inc., offered to answer your questions about Novell's marketing efforts and marketing programs, *NetWare Connection* has received dozens of questions. This article presents some of the most interesting questions submitted in the past two months and includes John's responses.

WORKING WITH UNIVERSITIES

Dear John Slitz,

I am a CNE and a student at the University of Houston. Currently, the university is in the process of migrating its servers to Windows NT (although the student lab is already having a lot of problems as a result). Almost all of the professors who teach MIS classes have a bias against Novell, as if they are either paid by Microsoft or they just don't know the technology.

I am concerned because the professors are influencing graduates to simply choose Microsoft's solution hands down. What is Novell doing to improve its relationships with universities?

Gary Chang

Novell is creating products that don't leave our customers with an either-or decision. For example, NDS for NT allows you to manage two environments easier than you can manage Windows NT alone. By allowing you to manage one User object for both environments, NDS for NT completely eliminates the pain of designing, deploying, and managing trust relationships between Windows NT domains.

As for relationships with universities, we have seen universities do great things with Novell technologies. One case in point is Clemson University, which has used Novell Directory Services (NDS) to create a single login for all of the university's environments, including NetWare, Windows NT, UNIX, and mainframes.

Novell Education courses are also offered at most universities, and you will find Novell products in almost every university. With a renewed interest in Novell and products such as Zero Effort Networks (Z.E.N.works), BorderManager, and NDS for NT, I think your professors will be excited about Novell. After all, professors like to create a vision of the future for their students, and the direction of network computing is in the directory—something that Novell does better than any other company.



STANDARDIZING ON ONE PLATFORM

Dear John,

At my company, we have a 250-user version of NetWare 4.1. We recently added two Windows NT servers to run applications that support only Windows NT. We must now add one more Windows NT server to run another such application.

Recently, upper management stated that they want to run only Windows NT on the network to simplify network management (manage only one network operating system) and reduce training costs (learn about only one network operating system). I believe we should leverage our current NetWare investment and upgrade to NetWare 5 when it is released.

I have explained that NetWare offers superior file and print services and that recent solutions such as NDS for NT allow you to manage Windows NT servers through NDS. However, upper management still wants to move to Windows NT. Can you offer any other reasons we should keep NetWare?

William Ryan

You are right about Novell providing solutions for managing Windows NT. To upper management, standardizing on one platform seems to reduce network management and training costs. What upper management may fail to realize, however, is that the platform to standardize on is NDS, which allows you to manage multiple environments as if they were one. In fact, with NDS, managing two environments is easier than managing Windows NT alone.

ConsoleOne in NetWare 5 takes this management concept one step further. Built on industry standards, ConsoleOne is a management framework that is 100 percent Java and leverages NDS. All of Novell's management products will soon be Java-based snap-in modules for ConsoleOne, so that you will have one management interface which will reduce the costs associated with network management and training. And since ConsoleOne is 100 percent Java, you will be able to manage your company's network from either the NetWare 5 server console or from a workstation. Check out ConsoleOne, and then let upper management know what's new at Novell.

AVOIDING BATTLES WITH VENDORS

Dear John Slitz,

Novell seems to avoid public battles with other vendors. For example, Novell's World-Wide Web site publishes articles that correct some of Microsoft's marketing propaganda, but I have not found this information in mainstream computer publications or newspapers. Also, several large companies that switched to Windows NT are going back to NetWare, but no one is publicizing these case studies.

Darryl Ludba

Novell is trying to take a more proactive stance in how we market our products. The best marketing that we can do is to deliver products. Novell will make a statement to the world during 1998 in how many products we will ship. Novell will ship more products this year than any other year in our history. And these products are focused products that leverage NDS to address key issues such as managing networking environments, managing desktops and applications, and managing connections to the Internet. Novell doesn't need to battle other vendors, Novell just needs to integrate with these vendors' products.

EVALUATING THE COST OF PRODUCTS

Dear John Slitz,

The cost of Novell's products seems to be somewhat high. Does Novell intend to make the cost of its products—particularly its add-on products—more competitive?

Richard Ailstock

First, our products deliver greater savings than our competitors' products. We have consistently shown that our products cost less to manage than Microsoft's and other vendors' products. Of course, our products are also proving to be more reliable and stable for conducting day-to-day business. For example, in a recent total cost of ownership study by Gartner Consulting, Novell's GroupWise was shown to cost significantly less than Microsoft's Exchange. (To read this study, go to <http://www.novell.com/groupwise/html/tco.html>.)

In addition, some of our products actually cost less to purchase while delivering more value in the box than our competitors' products. One classic case is GroupWise versus Exchange: On the surface, GroupWise appears to be more expensive than Exchange. However, if you add up the cost of purchasing all of Exchange's pieces, Exchange costs 15 to 30 percent more than GroupWise.

As you can see, Novell delivers total and true cost savings to the customer.

CONCLUSION

We continue to receive numerous questions for John Slitz and his marketing team. Please keep these questions coming! John Slitz will continue to answer questions about Novell's overall marketing strategy, and the appropriate marketing manager will answer your questions about

specific marketing programs. For example, Bryan Clark, manager of Novell's CNE Net program, will answer your questions about how Novell supports CNEs.

If you want to submit a question to John Slitz and his marketing team, visit NetWare Connection's web site (<http://www.novell.com/nwc>). You can also send an e-mail message to nwc-editors@novell.com, or you can send a fax to 1-801-228-4576. •

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Talking to Dell Computer's Mike Lambert



In an extremely competitive server market, Dell Computer, a Novell partner, is achieving phenomenal success. *NetWare Connection* recently asked Mike Lambert, vice president at Dell, to explain how its direct sales model is fueling this success.

NC: Could you explain Dell's direct sales model, since it's slightly different than most such models?

Mike: If you look at Dell today, you really need to look at it in two parts: First, we have what we call our transaction business, which is about 25 percent of our business. The easiest way to explain the transaction business would be that we advertise a product in your magazine and in some of your competitors' magazines. You are attracted to the product, and so the demand is created through advertising, direct mail, and so on. Then you pick up the phone, call us, and buy the product. . . . That has led to a great deal of success, primarily in small- and medium-sized companies.

We've also found that we've been very successful at selling servers on the web. And those are not just entry-level, low-cost kinds of products. I think the record is a \$130,000 server. The point is, there is a very knowledgeable set of customers who know what they want and are very comfortable with acquiring it either through telephone sales or on the Internet.

The other 75 percent of our business is what we call our relationship business. And the easiest way to explain that is we have salespeople in the field—education accounts, government accounts, state accounts, local accounts, major accounts—who call on you in the traditional fashion. We support these salespeople with systems engineers to help them with the technical side. The salespeople create the demand: So I call on you, and once I've convinced you to buy a Dell product, your company's procurement department will work with our people back in Austin to actually acquire the product. [Dell's headquarters are located in Austin, Texas.]

Another unique part of our direct sales model is that we build every product to order. We don't start building a server—or any Dell product for that matter—until you place an order. When we drop that order to the manufacturing line, the product with your exact configuration is built specifically for you. It doesn't matter whether you send us an order for one server or for 1,000 servers. Each product is built to order.

What that does for us is allow us to bring new technology to the market very quickly. Because we have virtually no

inventory, we don't have to deal with any of the inefficiencies associated with direct sales—building the wrong product, having a product sitting in the channel that customers don't want to buy, price protecting a product, giving resellers incentives to sell customers a product they may not want.

Instead, we can immediately take advantage of cost reductions on the part of our suppliers. We can also eliminate the dealer markup and the costs—lost margin associated with price protection, channel sell-in, and these kinds of things—which are totally unnecessary. And by eliminating all of that, we can be aggressive in our pricing because we have basically eliminated one or two middlemen and the inefficiencies associated with middlemen.

Another important aspect is that we have won a number of customer satisfaction surveys for product quality. There are really three reasons for that. One reason is that because we sell directly to you and we build your product, the product that we deliver to you has been fully tested and contains only Dell-certified parts. . . . When two or three people are touching the product between the manufacturer and the customer, there are all kinds of opportunities for irregularities and poor quality to find its way into the product. That just doesn't exist with Dell. You know when you buy a Dell product, it only contains Dell-certified parts, and if there's a problem, you call us, and we will make it right. There's nobody in between, no fingerpointing.

The second reason is that because we have virtually no inventory, the parts flow directly from our suppliers to our manufacturing line. We have one of the best relationships with our suppliers because when their parts have a problem, we are one of the first companies to bring that problem to their attention because the problem shows up very quickly in our manufacturing line. We keep detailed records in terms of vendors, product quality, and what that means in the building of our products, and feed that information back instantaneously to our suppliers.

The third reason is that once a product is delivered to you, we keep, again, detailed records of two areas: One area is what we call the initial field incident rate: If there are going to be problems, these problems tend to show up in the first 90 days of deployment of the product. And because I

know what we sold you and when we sold it to you, if you have a problem with the product, you call us for problem resolution. We know down to the hard drive, the mother board, and the network interface board, and whatever the problems are, we feed that information back instantaneously to our suppliers.

Now contrast that with most of our competitors: They build products, send them to the channel, and, in many cases, don't know where a lot of these products go. If you have seven to 10 weeks of inventory in the channel, a product may be three to five months old by the time it gets in the customer's hands. In our case, a product is only one or two days old. So the opportunity for lingering problems certainly exists with our competitors in a much greater fashion than it does with us.

NC: Since Dell is building custom servers, how quickly can I get a server that I order online?

Mike: Five to seven days.

NC: Can you expedite the order if I need that server sooner?

Mike: If you're ordering one server, probably not. But let me give you an example: One of our big customers, NASDAQ, uses our servers to host their web site. Last fall when there was quite a bit of turmoil in the stock market, NASDAQ's web site was hit exceptionally hard as people checked the status of their stocks.

NASDAQ called us and said, "Our servers are coming to their knees because of heavy usage, and we need to beef them up." In about three days' time, we took NASDAQ's order and shipped five or six additional servers.

NC: Dell is known for providing good support. Are you committed to continue providing free support?

Mike: Let me answer that question in a little different way: Our over-reaching goal is to be the easiest company to do business with. Now, I won't say we always fulfill that objective, but we certainly try to. And we are constantly looking at our business model. How can we improve? How can we change? How can we make our customers' experience the best it can possibly be?

That carries through to everything. How do we accept your order? How do we work with you? If you prefer to order electronically, we've set up a web site for our customers. Because we build every product to order, we have a database of these products, so we know everything we have ever sold you. And we'll make that information available to you, so we have a number of customers whose help desks use the same database that we use. You can actually take the product tag on the back of a product you bought from us, visit our web site, and see exactly what the product is. If you place an order over the Internet, you can track the status of this order over the Internet.

That even carries through to the support organization. We require most of our systems engineers in the field and most of our telephone support personnel (in the case of servers) to be MCSEs and CNEs . . . because we want them to be as knowledgeable and informed as the customers calling for support.

We continue to work very closely with our service partners to ensure that their level of training is high. What's really important to you is that when a problem does occur, someone takes responsibility for it. You call us, and when someone needs to be dispatched to your office, they show up on time and they fix the problem the first time. That's always our goal: on-time response and first-time fix.

NC: Can Dell install Novell software on a server?

Mike: We can preload both NetWare and Windows NT on a server if that's required. And we'll preload customized software—even a customer's own application if our business relationships warrant that.

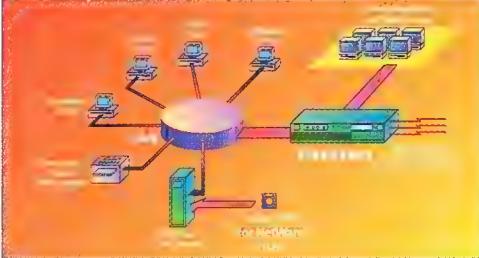
I can cite many examples where we've saved customers substantial sums of money by doing that for them and then shipping the server to the installation location. As a result, they didn't have to bring the server to an interim location, load the software, and deploy this server to the remote location. ☐

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NOVELL CERTIFIED PROFESSIONAL

Jeffrey F. Hughes and Blair W. Thomas

Managing NetWare 4

If you are managing a network that includes both NetWare 3 servers and NetWare 4 servers, you may be managing each environment separately. Obviously, managing users and network resources in both environments is redundant, increasing management costs. You may even need to hire more network support personnel to manage both environments.

This article explains how to add a NetWare 3 server to a Novell Directory Services (NDS) tree and how to manage all network resources through NDS. By integrating your company's NetWare 3 servers with the NDS tree, you can reduce management costs and manage network resources more efficiently.

INTEGRATING NETWARE 3 WITH NDS

You can use either Novell's NETSYNC utility (which is included with intraNetWare and NetWare 4.11) or NetVision's Synchronicity for NetWare 3 to integrate a NetWare 3 server with the NDS tree. You can then use NDS's hierarchical structure to organize users and network resources, and you can manage user and group accounts through NDS.

THE NETSYNC UTILITY

With the NETSYNC utility, you can attach up to 12 NetWare 3 servers to one NetWare 4 server in what is known as a *cluster*. To run the NETSYNC utility, you must load the NETSYNC4 NetWare Loadable Module (NLM) on the NetWare 4 server. You must then load the NETSYNC3 NLM on each NetWare 3 server.

After you have loaded the NETSYNC4 NLM, the NetWare 4 server can emulate a bindery. The NETSYNC utility then copies all of the user and group accounts from the bindery on each NetWare 3 server into the bindery context on the NetWare 4 server, creating a User or Group object for each account.

The NETSYNC utility also downloads every object in the bindery context on the NetWare 4 server to the bindery on each NetWare 3 server, thus creating a common, synchronized bindery. In essence, the NETSYNC utility creates a "super bindery," which contains the user and group accounts from all of the NetWare 3 servers in the cluster.

Although the NETSYNC utility synchronizes the bindery with the NDS tree, this utility has the following limitations:



- The NETSYNC utility supports only 12 NetWare 3 servers connected to one NetWare 4 server.
- The NETSYNC utility synchronizes the bindery on each NetWare 3 server only with the NetWare 4 server running this utility. If this NetWare 4 server is down, the NETSYNC utility cannot synchronize the bindery with the NDS tree.
- The NETSYNC utility does not resynchronize the bindery with the NDS tree when the NetWare 4 server is rebooted. As a result, any changes made to the NDS tree while the NetWare 4 server was down are not made to the bindery.
- The NETSYNC utility synchronizes the bindery only with the replica stored on the NetWare 4 server running this utility (rather than with the entire NDS tree).
- If the NetWare 4 server is synchronizing the bindery on multiple NetWare 3 servers, the NETSYNC utility sends each NetWare 3 server the user and group accounts for all of the NetWare 3 servers (up to 12 servers, as mentioned earlier). As a result, the performance of these servers is degraded.

SYNCHRONICITY FOR NETWARE 3

Synchronicity for NetWare 3, on the other hand, is not burdened with the limitations of the NETSYNC utility. Synchronicity for NetWare 3 provides a single point of administration and can scale to any number of NetWare 3 servers.

Synchronicity for NetWare 3 includes three components:

- The Global Event Service NLM, which runs on the NetWare 4 servers

- A synchronization agent, which runs on one NetWare 4 server and can communicate with up to 12 NetWare 3 servers
- A snap-in module for Novell's NetWare Administrator (NWADMIN) utility that supports bindery attributes

Global Event Service NLM

With Synchronicity for NetWare 3, you load an NLM only on the NetWare 4 server. No additional software is required on the NetWare 3 server. (See Figure 1.)

You must load the Global Event Service NLM on at least one NetWare 4 server containing a master partition or a read-write partition that will be synchronized with the bindery on each NetWare 3 server. If this NLM is not loaded, Synchronicity for NetWare 3 cannot synchronize the necessary information.

You can load the Global Event Service NLM on any number of NetWare 4 servers. If you load this NLM on multiple servers, you can load balance between servers and minimize network traffic. We recommend that you load the NLM on the NetWare 4 servers that are located near the NetWare 3 servers. This NLM requires little overhead because it monitors all NDS events but generates event notifications only when a change is made to the NDS tree.

Synchronization Agent

The synchronization agent supports bidirectional synchronization from the bindery to the NDS tree, and vice versa. When a change is made to the NDS tree, the Global Event Service NLM transmits an event notification to the synchronization agent, which automatically triggers the synchronization process.

When a change is made to the bindery, however, the synchronization process does not automatically occur. Instead, you must manually start this process, or you can schedule the process to occur at a specific time. (We recommend that you modify user and group accounts through NDS, rather than through the bindery. In this way, the changes will be automatically synchronized.)

The synchronization process is event driven: The bindery and the NDS tree communicate only when an NDS event occurs, thus minimizing network traffic. For each NDS event, only the relevant changes are synchronized, which further minimizes network traffic.

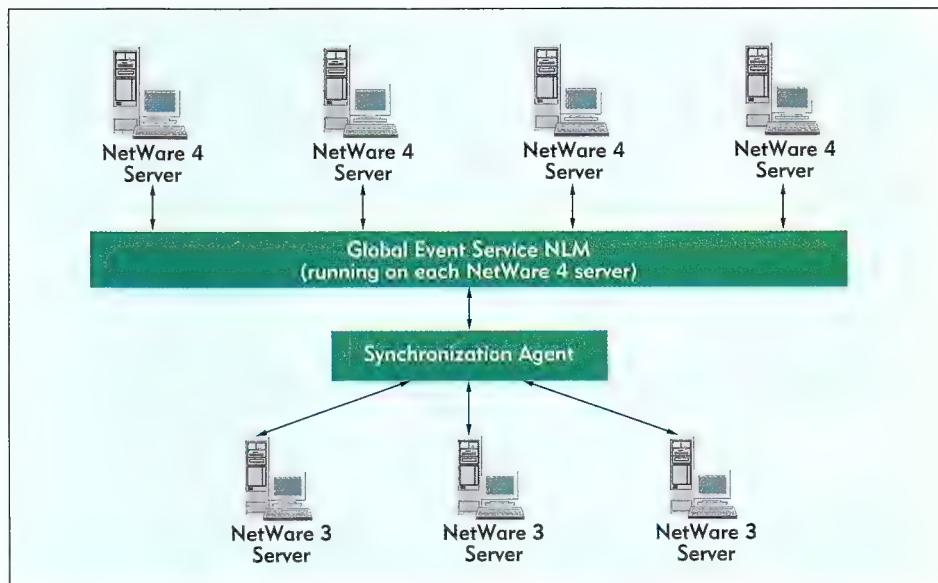
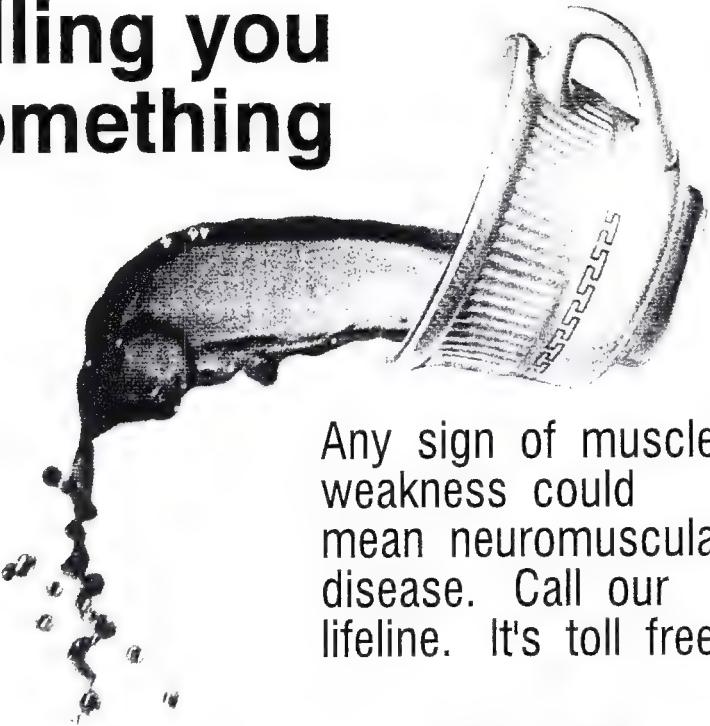


Figure 1. Each of the components for Synchronicity for NetWare 3 work together to provide integration between NetWare 3 and NetWare 4 servers.

In addition to synchronizing changes, the synchronization agent can synchronize users' NetWare 3 passwords with

their NDS passwords, and vice versa. You can synchronize these passwords when you install Synchronicity for NetWare 3,

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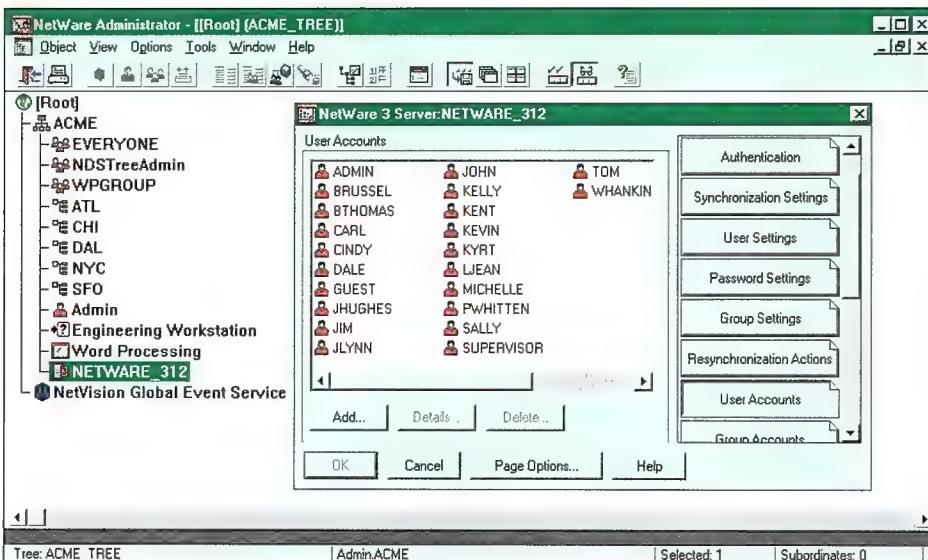


Figure 2. Using the NWADMIN utility, you can double-click a NetWare 3 Server object to view or modify the user and group accounts stored in the bindery.

or each user can synchronize his or her own password later using the NetVision Change Password utility. (Users can access this utility from a NetWare 4 server running Synchronicity for NetWare.)

Because NetWare 3 passwords are encrypted, the synchronization agent cannot retrieve these passwords directly from the bindery. However, when the user and group accounts from a NetWare 3 server are integrated with the NDS tree, NetWare 3 passwords are also imported into NDS. As a result, you can then change these passwords through NDS.

Snap-in Module

The snap-in module for the NWADMIN utility allows you to manage your company's NetWare 3 servers from a central location, just as you manage NetWare 4 servers. You manage a NetWare 3 server through the corresponding NetWare 3 Server object, which the snap-in module creates in the NDS tree when you integrate the server with the NDS tree.

You do not need to integrate every NetWare 3 server with the NDS tree. For example, if your company had a large network, you could integrate the NetWare 3 servers in a particular department only with the department's Organizational Unit (OU) object in the NDS tree. You could then grant a departmental administrator rights to manage that department's NetWare 3 servers and OU object.

When you integrate a NetWare 3 server with the NDS tree, you can also integrate existing user and group accounts.

As a result, you do not have to create a corresponding User or Group object for each user or group account. Instead, you simply double-click any NetWare 3 Server object to view or modify all of the user and group accounts stored on that server. (See Figure 2.)

In addition, you can "map" NDS usernames to NetWare 3 usernames using the one-by-one approach, which allows you to map a particular NDS username to the corresponding NetWare 3 username. If each NDS username is different than the corresponding NetWare 3 username, the one-by-one approach is required. To map an NDS username to a NetWare 3 username or to find out if an NDS username is mapped to a NetWare 3 username, you use the NWADMIN utility.

You also use the NWADMIN utility, to determine which NDS objects are being synchronized with bindery objects. You can then define rules that determine how name conflicts will be resolved during the integration process.

Although the snap-in module for the NWADMIN utility allows you to manage the synchronization process between the bindery and the NDS tree, this utility does not actually participate in the synchronization process. Rather, you use the NWADMIN utility to make changes to the NDS tree, and the synchronization agent automatically synchronizes these changes with the bindery. For example, if you modified a User or Group object that is associated with a NetWare 3 server, the synchronization process occurs,

synchronizing this change with the appropriate NetWare 3 server.

Security Features

Because Synchronicity for NetWare 3 uses NDS's security features, you can prevent unauthorized NDS access. Any network administrator who wants to manage user and group accounts through NDS must log in to the NDS tree. In addition, the bindery and the NDS tree communicate using the same security that NetWare 4 uses.

Synchronicity for NetWare 3 even provides its own security features. For example, Synchronicity for NetWare 3 includes a security definition list that you can use to further define which users and network resources can be integrated with NDS, thus restricting the amount of information that must be synchronized.

CONCLUSION

If you need to quickly upgrade to NetWare 4, you may want to simply use one of the many upgrade tools that are available. If you can upgrade to NetWare 4 more slowly, however, you should use the NETSYNC utility or Synchronicity for NetWare 3.

Because the NETSYNC utility is not designed to be a full-featured integration solution, we recommend using Synchronicity for NetWare 3. Synchronicity for NetWare 3 keeps both environments synchronized while providing you with a single point of administration.

Synchronicity for NetWare 3 has the following minimum system requirements:

- intraNetWare, NetWare 4.11, or NetWare 4.1
- NetWare 3.12 or NetWare 3.11
- 5 MB of free hard drive space on the SYS volume
- A Windows NT or Windows 95 workstation that is running the NWADMIN utility

For more information about Synchronicity for NetWare 3 or to download an evaluation copy, visit NetVision's Worldwide Web site (<http://www.netvisn.com>). You can also call 1-801-764-0400.

Jeffrey F. Hughes and Blair W. Thomas are senior consultants at Novell. They have written several books about NetWare and NDS. For more information about NDS design and implementation, visit their web site (<http://www.directorydesign.com>).

Switching to Switches

Mickey Applebaum

Editor's Note: The "Technically Speaking" column answers your technical questions, focusing on issues that affect network administrators. To submit a question for a future column, please send an e-mail message to nwc-editors@novell.com, or fax the question to 1-801-228-4576.

A network administrator recently asked me the following question: I just installed a switch on my company's network to improve performance, but the network actually seems slower. What's wrong?

Although switches have become a popular way to increase bandwidth and improve performance, they are not a panacea: On some networks, installing a switch may not improve performance at all. In fact, sometimes performance may even get worse. This article explains what a switch does and when you should install a switch on your company's network to improve performance.

HOW DOES A SWITCH WORK?

A switch forwards packets by establishing logical connections between network nodes. A switch divides a network into segments and provides each segment with dedicated bandwidth, thereby increasing the bandwidth that is available to nodes.

A switch's internal, shared medium—also called the *switching fabric*—is a high-speed circuit that can often reach speeds of more than 40 Gbit/s. When a node transmits a packet, the switch intelligently allocates part of its available bandwidth to create a dedicated, private connection between the transmission port and the destination port. Because the switch creates a private connection between ports, a node directly connected to a switch port does not have to wait for another node's transmission to end before transmitting its own packets. In addition, a switch can perform packet translation, allowing networks using different protocols (such as Ethernet, Token Ring, and FDDI) to communicate without a router.

A switch uses one of two processes to forward packets:

- Cut-through switching
- Store-and-forward switching

As soon as a cut-through switch reads a packet's destination media access control (MAC) address, the switch begins to forward the packet to this address. In other words, the switch begins to forward the packet before receiving the end of the packet. Although a cut-through switch improves performance, this

switch can propagate errors from one segment to another. Because a cut-through switch begins to forward a packet before receiving the end of the packet, this switch cannot verify the packet's checksum to detect errors.

A store-and-forward switch, on the other hand, receives and stores the entire packet before forwarding this packet to the packet's destination MAC address. Because a store-and-forward switch waits to receive the entire packet, this switch can verify that the packet is complete and that the packet's checksum matches its contents.

WHEN SHOULD YOU USE A SWITCH?

Before you install a switch on your company's network, you should analyze the network design, the amount of network traffic, and the applications running on the network. A switch is best suited for networks that have the following characteristics:

- A large amount of data packet traffic (such as client-based database applications, client-server lookups, and the manipulation of large graphics files)
- Multiple source and destination nodes
- Network saturation issues (such as a large amount of multi-cast or broadcast packets)

Data Packet Traffic

By implementing a switch, you can reduce the amount of data packet traffic on a segment. For example, if your company's network contained 150 nodes and you divided the network into six segments with 25 nodes each, a node would compete for bandwidth with only 24 nodes instead of 149 nodes. As a result, the switch would increase the amount of available bandwidth on each segment.

Multiple Source and Destination Nodes

If multiple source nodes are sending packets to multiple destination nodes, implementing a switch can increase performance. For example, suppose that your company's network included several servers, each of which provided different network services, such as file and print services or database services. If you connected each server to a port on the switch, the servers would have equal access to other segments.

To further improve performance, you could load balance network services among the servers. For example, if all users logged in to one server to access applications and another server to access an e-mail program, a switch might not significantly improve



performance. But if you installed both the applications and the e-mail program on each server, you could have an equal number of users log in to each server. In this case, a switch could dramatically improve performance.

Network Saturation

Network saturation occurs when a segment becomes so overloaded with traffic that users notice performance has slowed down. You can eliminate network saturation in several ways, including the following:

- Using a faster network technology (such as moving from Ethernet to Fast Ethernet)
- Changing the network protocol (such as moving from Fast Ethernet, which is a collision-detection protocol, to FDDI, which is a deterministic, token-passing protocol)
- Dividing the network into multiple segments that have less traffic

If you decide to install a switch to eliminate network saturation, you must carefully evaluate the network design before you create multiple segments. Because a switch aggregates traffic, the segment between a switch and a server can become saturated if nodes are sending a lot of packets to the server. To prevent the segment from becoming saturated, you must properly "size" the segment between the switch and the server. That is, you must ensure that both the switch itself and the network interface board in the server can adequately handle the throughput on the network. Otherwise, the switch or the server can actually become a bottleneck.

You can begin by determining the number and the type of workstation connections to the switch. For example, suppose that your company's network included one 10 Mbit/s segment and that you wanted to add a switch and create three additional 10 Mbit/s segments for the workstations. This solution would provide aggregate throughput of 30 Mbit/s to the workstations, with an average data load of 10 Mbit/s (assuming that all segments were running at an average of 30 percent utilization). One Ethernet network interface board running in full-duplex mode to the switch could handle this throughput, providing a 20 Mbit/s segment between the switch and the server.

On the other hand, if you created six 10 Mbit/s segments for the workstations, you would want to use at least a 100 Mbit/s protocol between the switch and the server. You would then install either a Fast Ethernet, FDDI, or ATM network interface board in the server and use a switch with a 100 Mbit/s port. If you created ten 10 Mbit/s segments, you would want to use a 100 Mbit/s protocol that can operate in full-duplex mode (Fast Ethernet or FDDI).

WHY WOULD A SWITCH NOT IMPROVE PERFORMANCE?

There are several reasons that performance might not improve—or might even become worse—after you install a switch on your company's network:

First, the nodes on the network may not be generating enough traffic to warrant a switch. For example, suppose that your company's network included one server and 20 nodes and that users mainly accessed word-processing and spreadsheet applications. In this case, replacing a hub with a switch would probably not improve performance, simply because users are not generating enough traffic.

Second, the source nodes may be sending packets to the same destination nodes. For example, suppose that your company's network included one server and 150 nodes and that users accessed a database application, as well as word-processing and spreadsheet applications. As mentioned earlier, because a switch establishes private connections between the transmission port and the destination port, the switch can transmit multiple packets at one time, thus improving performance. However, if multiple source nodes are sending packets to the same destination node (the server, in this example), a switch will not improve performance because the switch can establish only one active private connection per port.

For example, suppose that you installed a switch on your company's network and that you divided the network into seven segments: one segment for the server and six segments for the workstations. If the server were the main destination node, you simply would have changed the point of contention from one segment containing both the server and the workstations to the new segment containing only the server. Now the other six segments would have to

contend with each other to send packets to the server segment.

Regardless of how fast a segment is, only one packet can be transmitted across the segment at a time. If the segment is saturated, therefore, installing a 100 Mbit/s port (Fast Ethernet, FDDI, or ATM) in the switch will not significantly improve performance.

Third, a server may be causing performance problems. For example, suppose that your company's network had a large amount of traffic, indicating a bottleneck. After you installed a switch, however, performance did not improve. In this case, the bottleneck could be the server itself. For example, the network interface board, the bus, or the disk channel could be saturated.

To determine whether performance problems are caused by the network or the server, you could use a protocol analyzer (such as Novell's LANalyzer for Windows) to monitor traffic on the wire, and you could check the server statistics. If traffic is minimal but the server statistics indicate network saturation, the performance problems are obviously caused by the server.

CONCLUSION

A switch is not a one-size-fits-all solution, as some people claim. Rather, a switch benefits networks that have enough traffic to justify creating multiple segments and that have multiple source nodes communicating with multiple destination nodes. On the other hand, a switch does not benefit low-utilization networks containing only one server. In fact, a switch may impose a significant performance hit in these cases.

So before you decide that a switch is the solution to all of your company's performance problems, do some homework: Find existing bottlenecks, and determine whether a switch will actually improve performance. And don't take a vendor's performance statistics for a particular switch at face value. You should always ask to evaluate a switch on your company's network before you purchase the switch, and you should get a performance guarantee. That way, if the switch doesn't improve performance, you can return it.

Mickey Applebaum has worked with NetWare for more than 14 years. Mickey provides technical support on the Internet for The Forums (<http://theforums.com>). ●



NETWORK BASICS

Steve Fogarty

Fax and E-mail Integration

Turning an E-mail System
Into a Fax Solution

According to a recent study commissioned by Pitney Bowes and Gallup, the average employee of a large company sends and receives 178 messages per day, and a majority of people prefer sending faxes over using courier services and e-mail systems if they need to send an urgent message. According to the study, "the fax machine continues to thrive as the preferred method to receive urgent business documents." Dennis Roney, president of Pitney Bowes Facsimile, concludes, "Companies should begin to implement effective fax management strategies to take advantage of popular fax technology."

One management strategy is to integrate faxing with e-mail. With today's integration solutions, you can offer users the benefits of both technologies while avoiding the drawbacks. This article explains the advantages and disadvantages of each technology and then examines several solutions for integrating these technologies.

FAXING AND E-MAIL: EVALUATING THE PROS AND CONS

Faxing offers several benefits: Faxing is easy to set up and to use; it is also immediate and secure. And since all fax machines use the same standards, users can always send and receive faxes, making this technology very reliable.

Unfortunately, faxing is also inefficient and costly. Users must leave their desk to send a fax and may even have to wait in line to use the fax machine. In addition, faxes must be manually routed to the recipients, and fax machines require a dedicated telephone line.

E-mail is emerging as a universal messaging source and repository. E-mail is less expensive than faxing and can be integrated with multiple public and private networks (such as paging services, X.400-based networks, and the Internet). E-mail is also easy to use and is convenient since users do not have to leave their desk.



However, most companies do not trust e-mail—particularly Internet e-mail—for delivering urgent or confidential documents. In addition, e-mail systems with integrated value-added services (such as faxing) can be difficult to manage.

SAVE TIME AND MONEY BY INTEGRATING FAXING AND E-MAIL

Server-based faxing saves time and money over traditional faxing. According to Peter J. Davidson, president of Davidson Consulting, server-based faxing saves from three to six minutes per fax over conventional fax machines. For a small company sending an average of 12 faxes per day, the savings translate into U.S. \$144 to U.S. \$3,120 per year in labor alone. For a larger company sending an average of 120 faxes per day, the savings range from U.S. \$1,440 to U.S. \$31,200 per year in labor alone.

By combining the convenience and reliability of faxing with the cost-effectiveness of e-mail, you can add value to your company's network. The key to realizing this value lies in selecting an integration solution that makes sense given your company's size, resources, and expertise.

You can use one of the following solutions to integrate faxing with Novell's GroupWise or with other e-mail systems:

- Workstation integration solutions (such as WinFax)
- Fax gateways (such as Novell's fax gateway for GroupWise 4.1)
- Fax servers (such as Cheyenne's FAXserve and Biscom's FAXCOM for NetWare)
- Integration solutions from a messaging service provider (such as dotOne and MCI Connect)

Purchasing a Fax Server Versus Using a Messaging Service Provider

Suppose that you wanted to implement an integrated fax and e-mail solution for 100 GroupWise users and that you wanted to offer these users bidirectional, user-routable faxing. If you were trying to choose between purchasing a fax server or using a messaging service provider, you might want to compare the resources you would need for each solution. Depending on the fax server you chose, you might make the following comparison:

	Fax Server	Messaging Service Provider
Services From the Telephone Company		
A fractional T-1 line	Yes	No
4 to 10 trunk-type loop start	Yes	No
"Wink start" service for direct inward dialing (DID)	Yes	No
Dual-tone modulation frequency (DTMF) touch-tone signaling	Yes	No
A block of 100 telephone numbers	Yes	No
Hardware		
A PC with sufficient hard drive space and RAM	Yes	No
A fax board with 4 or 12 ports	Yes	No
An analog or Integrated Services Digital Network (ISDN) modem or frame-relay hardware (such as a router and a CSU/DSU)	No	Yes
Software		
Fax server software	Yes	No
NetWare server software	Yes	No
Native applications (such as WordPerfect) for each file type you want to support	Yes	No
Windows NT or Windows 95	Yes	No

Workstation Integration Solutions

Although workstation integration solutions are obviously superior to traditional faxing, these solutions are impractical for most companies that use GroupWise or another e-mail system. Because workstation integration solutions require a dedicated telephone line and a fax board for each workstation, these solutions can be expensive and time consuming to implement, and they provide limited scalability.

In addition, most commercially available workstation integration solutions do not integrate with the inbox and outbox of today's e-mail systems, including GroupWise. As a result of these drawbacks, workstation integration solutions are appropriate only for small companies, home offices, and mobile users (such as salespeople).

Fax Gateways

Fax gateways can be one of the easiest ways to partially integrate faxing with e-mail. In most cases, you can use fax gateways to integrate faxing with an e-mail system's outbox and address book. You can also use a fax gateway to elim-

inate the need for users to convert documents into graphics files, such as .TIFF or .PCX files, before sending them.

However, fax gateways do offer the following drawbacks:

- Many fax gateways do not support inbound routing, and fax gateways that do support inbound routing typically scale poorly in performing this task. (*Inbound routing* enables an inbound fax to be routed directly to a user's e-mail inbox.)
- In general, fax gateways provide limited scalability. One fax gateway is typically required for each e-mail post office or message transfer agent. According to David Ferris, a messaging industry analyst and a founder of Ferris Research, "when inbound faxes are supported, you can usually receive only inbound faxes over analog lines, requiring one analog line per user."
- The document conversion feature offered by most fax gateways is typically both expensive and inconvenient. Most fax gateways require you to purchase and install the native application (such as WordPerfect, Quattro

Pro, Word, Excel, AmiPro, or Lotus 1-2-3) for each file type you need to support.

If users request support for other file types, you may need to purchase additional applications, which can quickly become even more expensive. In addition, the document conversion feature is often unstable and can easily become a bottleneck.

Fax Servers

Fax servers offer several advantages over fax gateways. For example, fax servers scale well: One fax server can typically serve your company's entire enterprise, regardless of the number of e-mail post offices or message transfer agents your company has.

In addition, most fax servers support multiple inbound routing methods directly to a user's e-mail inbox, including T.30/T.33, direct inward dialing (DID), and dual-tone modulation frequency (DTMF). As a result, fax servers enable bidirectional faxing from within GroupWise and other e-mail systems. Some fax servers even include least-cost routing as a standard feature, allowing users

to send faxes when long-distance telephone rates are low.

Fax servers also offer a superior document conversion feature. For example, RightFax's RightFAX Enterprise 5.2 enables document-to-TIFF file conversion, without requiring a native application or a rendering program.

Fax servers do offer two drawbacks, however: complexity and expense. For example, to set up a fax server for a company with 100 GroupWise users, you would need to purchase the following services, hardware, and software:

- **Services From the Telephone Company.** The exact services you would need to purchase from the telephone company would depend on the size of your company and on the fax server you chose. For example, you might need to purchase a fractional T-1 line, 4 to 10 trunk-type loop start, "wink start" service for DID, DTMF touch-tone signaling, and a block of 100 telephone numbers.
- **Hardware.** Again depending on the fax server you chose, you would need to purchase a PC with sufficient hard drive space and RAM to run the fax server software, a fax board, and an analog or Integrated Services Digital Network (ISDN) modem or frame-relay hardware (such as a router and a CSU/DSU).
- **Software.** You would need to purchase fax server software. Depending on the fax server you chose, you might also need to purchase NetWare server software, Windows NT or Windows 95, and native applications (such as WordPerfect, Quattro Pro, Word, Excel, AmiPro, or Lotus 1-2-3) for each file type you need to support.

In addition to considering these costs, you should estimate the costs of managing the fax server. For example, you may need telephone support to install and troubleshoot the fax server, or you may need additional training so you can properly manage the fax server.

Integration Solutions From a Messaging Service Provider

If you work for a large company, you can probably justify the complexity and the expense of implementing and supporting a fax server. If you work for a small company, on the other hand, you

may want to consider using a messaging service provider instead.

Messaging service providers offer basic Internet e-mail access. If you use a messaging service provider for Internet e-mail access, you continue to manage your company's e-mail system, but you rely on the messaging service provider to connect that e-mail system to the Internet. The messaging service provider sets up and maintains virus scanning and other security features, such as a firewall protecting your company's network from the Internet and configuring Internet e-mail access. In addition, the messaging service provider tracks services at a single location—a capability known as *usage reporting*.

Messaging service providers are also beginning to offer advanced faxing services. To understand the integration solutions offered by messaging service providers, you must first understand how messaging service providers offer Internet e-mail access. A messaging service provider maintains a single hub that provides a connection to the Internet for the companies using this messaging service provider. These companies access the hub via an analog or ISDN modem or via frame-relay hardware (such as a router or a CSU/DSU) to send and receive Internet e-mail.

Messaging service providers are extending this hub-based messaging infrastructure to faxing. By providing inbound/outbound routing and document conversion through a single hub, a messaging service provider can offer your company the same benefits offered by an in-house fax server, with the added benefit of requiring only one modem or frame-relay connection.

Using a messaging service provider can be an economical solution: In terms of initial expense, hardware and software costs are essentially nonexistent: The only exception is if you need to purchase a modem or frame-relay hardware.

Recurring costs are typically low as well. Fixed costs, in the form of voice T-spans or qualified technical personnel, are often eliminated, and variable costs are usually reduced through better least-cost routing. For most companies, the cost of sending and receiving faxes both domestically and internationally is lower with a messaging service provider than with other integration solutions because the provider is aggregating the fax traffic

of thousands of companies and is generating a large volume of long-distance traffic. As a result, the messaging service provider can negotiate low long-distance telephone rates.

Perhaps the most compelling reason to consider using a messaging service provider is simplicity. For example, you can compare the requirements for setting up an in-house fax server with those for using a messaging service provider. (See "Purchasing a Fax Server Versus Using a Messaging Service Provider.")

When you choose a particular messaging service provider, you should evaluate the network transport architecture that the messaging service provider uses. Some messaging service providers transfer faxes via the Internet, thereby undermining the security and performance advantages that make faxing an attractive option. A messaging service provider should deliver a fax to its destination entirely via private networks comprised of telephone, frame-relay, and T-1 lines.

CONCLUSION

If you want to integrate faxing with GroupWise or with another e-mail system, you have several options: As explained in this article, you can use a workstation integration solution, a fax gateway, a fax server, or an integration solution from a messaging service provider. As you tackle your company's integration challenges, you should decide which integration solution best meets your company's needs for integrating faxing with e-mail. As you make this decision, you should consider the support requirements for each integration solution, and you should ensure that your company has the necessary resources to support the solution you choose.

Integrating faxing with GroupWise or with another e-mail system may seem daunting, from both a technical perspective and a financial perspective. But by carefully evaluating which components to outsource and which components to implement in house, you can create a truly integrated messaging infrastructure for your company.

Steve Fogarty is chief messaging architect and cofounder of dotOne Corp. (formerly Teltrust.com), a Utah-based messaging service provider and messaging systems integrator. You can reach Steve at sfogarty@dotOne.com. •

Resources at Your Fingertips

Kimberly Brinkerhoff-Jones

Like many other magazines, we occasionally find ourselves in the awkward position of having to cancel an article at the last minute. Unfortunately, one such article is this month's "Practical Networking." After tearing our hair out trying to fix the article, we gave up and decided to start from scratch by writing a new article—only one day before we were scheduled to go to press.

As we discussed what resources we could consult to write this article, we realized that we have some of the best resources available on our own World-Wide Web site (<http://www.novell.com/nwc>). We also realized that although many of you have visited this web site, you may not be familiar with all of the resources it offers. So what could be more practical than explaining how you can use *NetWare Connection's* web site to make your job easier?

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Not only can you renew your subscription online, but you can also purchase a variety of resources from the *NetWare Connection* Bookstore, which you can access by clicking the Bookstore button on *NetWare Connection's* home page. For example, the *NetWare Connection* Bookstore offers books published by Novell Press at a discount of 20 to 30 percent. These books are an ideal source if you need in-depth networking information or if you need to study for Novell certification exams.

The *NetWare Connection* Bookstore offers other resources that can help you become a Novell certified professional. Through the *NetWare Connection* Bookstore, you can purchase technical training videos from LearnKey Inc. And if you want hands-on experience with Novell products, you can purchase CNE Product Link, a set of CD-ROMs that contain limited-user versions of Novell shipping products, beta software, and early-access release technologies. CNE Product Link is an invaluable tool for evaluating Novell products and for managing your company's network.

Shareware and Freeware Utilities

You should also check out the latest shareware and freeware utilities on *NetWare Connection's* web site. You can download

shareware and freeware utilities in many categories, such as Backup, Internet, and Network Management. You can also view the file size, the system requirements, and other information for each utility, along with a description of the utility's features and a rating assigned by our product reviewer.

To access the shareware and freeware utilities, visit *NetWare Connection's* home page, and click the Network Resources button. On the Network Resources page, you will also find an extensive collection of hypertext links to web sites that offer networking information and resources.

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You can view articles from the current issue online by visiting *NetWare Connection's* home page and selecting a particular article. You can also view articles from past issues of *NetWare Connection* by visiting our home page and clicking the Past Issues button. You then select a particular issue from one of the pull-down menus and click the Go button.

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We hope you look forward to receiving *NetWare Connection* because of the product information, the technology overviews, and the technical tips and tricks in each issue. To continue receiving *NetWare Connection*, however, you must renew your subscription once a year by completing a *NetWare Connection* subscription form. (If you ever stop receiving *NetWare Connection* but don't know why, your subscription has probably expired. All you have to do is complete the subscription form to restart your subscription.)

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Novell Partner Passport

If you are a CNE, Master CNE, Certified Novell Instructor (CNI), systems integrator, software developer, or reseller, you should definitely check out the Novell Partner Passport Worldwide Web site (<http://www.novell.com/passport>). A one-stop source for technical information, training videos, developer software, and marketing guides, the Novell Partner Passport is well organized and easy to navigate.

You simply identify yourself as a technical person, developer, business manager, or sales person, and you can access information and resources designed specifically for you. For example, if you were a CNE, you would select the Technical Person link. You could then access resources such as a computer-based training (CBT) for NetWare and Novell Directory Services (NDS). You could also view technical videos about the network server platform, network manageability, or intranet and Internet services. And you could access technical presentations and demos of Novell products, Novell white papers, and CNE success stories.

You could also register to evaluate Novell's beta products and get information about support tools such as Novell Support Connection CD, Virtual SE, and Consulting CD. You could even access *NetWare Connection's* web site as well as find out how to subscribe to *Novell's Developer Notes* and *Novell's Application Notes*.

If you are a developer or a reseller, the Novell Partner Passport web site will make it easier for you to get information about Novell products and services.

NetWare First Look

Novell has announced NetWare First Look, a promotion that allows you to upgrade to NetWare 5 for a discounted rate. To qualify for NetWare First Look, you must purchase or upgrade to NetWare 4.11 between April 1, 1998 and two weeks after NetWare 5 ships. If you qualify for this promotion, you will also receive Netscape Enterprise Server for NetWare, the latest Novell Client 32 CD, and Novell's Year 2000 information CD.

NetWare First Look is available through a Novell authorized reseller. For more information about NetWare First Look, visit Novell's web site (<http://www.novell.com>). You can also call 1-800-NETWARE or 1-801-861-7000.

New Clustering Solutions

Novell recently announced two clustering solutions: Standby-Server Many-to-One and Orion Phase I. StandbyServer Many-to-One, which was released in May, is a hardware-independent solution that allows one server to protect multiple servers from failures. StandbyServer Many-to-One mirrors data from the primary servers to a standby server. If a primary server fails, the standby server assumes network traffic and restores the backup data. StandbyServer Many-to-One supports NetWare 3 and 4 and will soon support NetWare 5.

Orion Phase I is the first phase of Novell's line of clustering products, which are code named Orion. Expected to be available by the end of June, Orion Phase I provides the following:

- **Support for Two Active Servers.** Rather than supporting one active server and one inactive server for backup protection, Orion Phase I supports two active NetWare 4.11 servers.
- **Failover Protection.** If a server fails, an alternate server seamlessly assumes network traffic, eliminating downtime.
- **Shared Storage.** Orion Phase I eliminates the need to maintain duplicate files on separate servers.

Orion Phase I supports intraNetWare and NetWare 4.11. Orion Phase II, which is expected to ship during the fourth quarter of 1998, will support NetWare 5 and multiple nodes.

For more information about StandbyServer Many-to-One, SnapShotServer, Orion, or Orion Phase I, visit Novell's web site at <http://www.novell.com/products/clusters>.

Z.E.N.works

Novell is now shipping Zero Effort Networks (Z.E.N.works), a new management tool that allows you to access and manage network resources more easily. Using NDS, Z.E.N.works creates a digital profile for each user on the network. This profile specifies a user's individual preferences, such as desktop configuration and printers. A user can then access these preferences from any workstation on the network.

You can get a free copy of Z.E.N.works if you are a ManagementWise customer and have a maintenance contract with Novell. Otherwise, you can purchase Z.E.N.works through your Novell authorized reseller for U.S. \$39 per user. You can also call 1-800-NETWARE or 1-801-861-7000.

NetWare 5 First Class

Novell has announced NetWare 5 First Class, a one-day training seminar that will give you hands-on experience with NetWare 5 even before it ships. If you attend NetWare 5 First Class, you will learn the following skills to help you prepare for your company's NetWare 5 upgrade:

- Upgrading a NetWare 4.1x server to a NetWare 5 server
- Migrating a NetWare 3.1x server to a NetWare 5 server
- Choosing an upgrade method and protocol strategy
- Creating and managing NSS volumes on a NetWare 5 server
- Using the Novell Upgrade Wizard

In addition, you will learn about the new and enhanced features of NetWare 5. For example, you will learn how to provide TCP/IP functionality for workstations by configuring a NetWare 5 server and workstations to use the Domain Naming System (DNS) and Dynamic Host Configuration Protocol (DHCP) databases. You will also see demonstrations of Novell's new management products, including Java ConsoleOne and Z.E.N.works.

You can register for NetWare 5 First Class through a Novell Authorized Education Center (NAEC). To find the NAEC nearest you, visit Novell Education's web site (<http://education.novell.com>). You can also call 1-800-233-EDUC or 1-801-222-7800. ☎



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NUGs of the Round Table

Answering Your Technical Questions

Sandy Lindstrom

As you are painfully aware, inexpensive technical support is a scarce commodity these days. You can browse the Internet looking for answers to your technical questions, but if you don't find answers there, you may have to pay a lot of money for telephone support. Before you give up hope of finding affordable technical support, however, you might want to check out your local NetWare user group.

Many NetWare user groups offer a unique kind of technical support that costs you only the time it takes to attend a meeting. At their monthly meetings, NetWare user groups may set aside time for what is often called a round-table discussion, in which you can ask technical questions and find solutions to networking problems.

NO TWO ROUND TABLES ARE ALIKE

Both the Portland, Oregon NetWare user group and the Grand Rapids, Michigan NetWare user group begin each meeting with a dinner, which gives members a chance to casually discuss networking challenges while getting to know each other better. Once the dinner is finished, the round-table discussion begins. During this discussion, anyone can ask a technical question or raise a networking issue for the members to discuss.

Allan Hurst, president of the Silicon Valley, California NetWare user group, begins his group's round-table discussion by asking for a volunteer to describe a networking problem and to illustrate this problem on a blackboard. Some of the problems that have been discussed started out as funny anecdotes, such as one member's story about what can happen when you never check your tape backups. However, an anecdote frequently turns into a valuable learning experience for everyone who participates in the discussion—even if the anecdotes demonstrate only what *not* to do as a network administrator.

The Tampa-St. Paul NetWare user group also holds a round-table discussion, which the group refers to as Tech Talk, at each meeting. Although this discussion is everyone's favorite part of the meeting, it sometimes needs a jump start. After enduring many long silences with no one asking a technical question, Alan Frayer, the group's president, discovered that the best way to start a discussion is to raise a networking issue. He has found that this approach is extremely effective in getting members to talk about networking. In addition, this approach often reminds members of their own networking problems, which they can then add to the discussion.

FINDING SOLUTIONS

As you attend meetings and participate in round-table discussions, you may be surprised at how much you learn from

fellow networking professionals. At the Quad City NetWare user group in Davenport, Iowa, many members have been enlightened by the group's round-table discussions. For example, a member once explained the problems you may experience if the workstations on your company's network are running an older version of Novell's client software.

Not only can you learn new things from a round-table discussion, but you can use other members as resources to steer you in the right direction. For example, the Southern Arizona NetWare user group held a round-table discussion about the advanced parameters in a NET.CFG file. Bob Fischella, the group's librarian, was able to refer everyone to a related article in *Novell Application Notes* due to his extensive knowledge of the resources available through the group's library.

GETTING INVOLVED

The round-table discussions held by local NetWare user groups are a valuable resource that can provide answers to your technical questions. For more information about NetWare Users International (NUI) or to locate the NetWare user group in your area, visit NUI's World-Wide Web site (<http://www.novell.com/nui/groups>). You can also call 1-800-228-4684 or 1-801-228-4500.

Sandy Lindstrom is the chapter relations manager for NUI, North America (NUI, NA). •

Seminars in Australia

Novell and NetWare Users International (NUI) are sponsoring technical seminars in Australia this month. These seminars, which will feature Novell's Zero Effort Networks (Z.E.N.-works) and soon-to-be-released NetWare 5, will be held in the following cities:

Date	City	Place
June 1	Adelaide	Hilton
June 2	Melbourne	Sofitel
June 4	Perth	Burswood Resort Casino
June 9	Brisbane	Heritage
June 10	Sydney	Regent
June 12	Auckland	Carlton

Registration begins at 8:30 a.m. on the day of the seminar, and the seminar begins at 9 a.m. For more information about these seminars, send an e-mail to sritter@novell.com. •

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NetWare Users International (NUI) is an association that supports Novell networking professionals. NUI members represent all facets of the networking industry, including network administrators, IS managers, systems integrators, CNEs, Master CNEs, and Certified Novell Administrators (CNAs).

NUI provides a great opportunity to stay up-to-date with current networking technologies. In addition to publishing *NetWare Connection*, NUI offers the following resources. (To receive a complimentary subscription to *NetWare Connection*, visit <http://www.novell.com/nwc/sub.html>.)

NetWare User Groups. As you can see from the preceding list, NetWare user groups are located throughout the world. Each user group holds monthly meetings in which you can solve networking problems, find out about new technology, and exchange networking tips with other professionals. (If you cannot find an NUI group in your area, you can call 1-800-228-4684 or 1-801-228-4500. You can also send a fax to 1-801-228-4577.)

InterConnect '98 Conferences.

InterConnect '98 conferences are held in the United States and Canada. As a member of NUI, you get a discount on conference registration. (See the ad on p. 45.)

For more information about NUI, visit NUI's web site (<http://www.novell.com/nui>). You can also call 1-800-228-4NUI or 1-801-228-4500.

That's Entertainment

Matthew Jones

Now that summer is here, all of the major Hollywood movie studios will be releasing potential blockbusters. If you need help deciding which movies are worth watching, you should visit the World-Wide Web sites featured in this article. These web sites offer the latest movie reviews, as well as industry news and profiles of movie stars. While you are waiting for the next show to start at your local movie theater, you can check out this month's network resources and games. You can also read about the new products I have found. (See "Product Snapshots" on p. 49.)

WORLD-WIDE WEB SITES

Siskel and Ebert (<http://www.siskel-ebert.com>) offers movie reviews from Gene Siskel and Roger Ebert, the dynamic duo of film critics. If you have ever watched the "Siskel and Ebert" television show, you know that Siskel and Ebert rate movies by giving them either a thumbs up or a thumbs down. At Siskel and Ebert, you can view the thumbs-up and thumbs-down ratings for movies that were recently released. You can also listen to complete reviews from the "Siskel and Ebert" television show.

If you want to rent a movie rather than braving the crowds at your local movie theater, you can view Siskel and Ebert's recommendations for movies that are available on video. For example, you can view the video pick of the week, and you can view a list of the best and worst movies of each year for the past 10 years.

Like Siskel and Ebert, Film.com (<http://www.film.com>) features movie reviews from some of the industry's top film critics. However, Film.com also allows you to submit your own movie reviews and to read movie reviews submitted by other users. You can even participate in a weekly poll, rating the best and worst movies of the week, and you can add your comments to a movie-related chat forum. In addition, you can purchase movie soundtracks, posters, and other memorabilia.

You can also find movie reviews and more on Internet Movie Database (<http://www.imdb.com>), which offers a variety of information about nearly 150,000 movies. To find out what film critics had to say about a particular movie, you can search for the movie by key word, by title, by character name, or by a member of the cast or crew.

In addition to movie reviews, you can view a list of the movie's cast and crew, a summary of the plot, and a selection of memorable quotes from the movie. If you are interested in movie minutiae, you can even find obscure information, such as what companies were involved in producing the movie and how much money the movie has generated in ticket sales.

NETWORK RESOURCES

Whether you are a network administrator or a developer, you probably want to learn more about Java, the popular programming language developed by Sun Microsystems Inc. You can find basic Java information and advanced Java resources at Cafe au Lait (<http://sunsite.unc.edu/javafaq>). For example, you can read Java-related articles, Java tutorials, and Java frequently asked question (FAQ) lists. You can also download Java development tools and application program interfaces (APIs).

After you have become familiar with Java, you can visit the Java Applet Review Service (<http://www.jars.com>), which offers a database containing hundreds of Java applets and a rating for each applet. Because these applets are organized by both category and rating, you can quickly and easily locate applets that meet your company's needs.

At the Java Applet Review Service, you can also subscribe to a Java newsletter, which you will receive via e-mail. In addition, you can chat with developers in various Java forums, and you can purchase books about Java programming in the online bookstore. You can even post job openings or browse the job openings that have been posted by developers.

NETWORK GAME OF THE MONTH

Die by the Sword from Interplay Productions is a new adventure game in which you must use sword play to fight your way through a series of catacombs. As you journey through the catacombs, you must watch for monsters, who hide in barely discernible pits, waiting to attack you. You must also beware of other deadly traps, such as poisoned darts that can be ejected from the walls without warning.

Die by the Sword uses a proprietary technology that translates your moves in real time. As a result, you have extreme freedom of movement: You can execute any sword-fighting move, and the proprietary technology makes this move appear just as it would if an actual human being were performing the move. Die by the Sword also includes a move editor, which allows you to link combinations of predefined moves and execute them with a single keystroke.

You can play Die by the Sword in standalone mode until you have honed your fighting skills in the catacombs. You can then enter a virtual arena to engage in duels, playing with up to three other people over a network connection.

Die by the Sword is available for Windows 95. You can purchase Die by the Sword at the suggested retail price of U.S. \$49.99. For more information about Die by the Sword, visit Interplay Productions' web site (<http://www.interplay.com>). You can also call 1-800-468-3775 or 1-714-553-6678.

Product Snapshots

When I am looking for the latest computer games, I often find new and interesting products. Product Snapshots gives you a quick overview of the most useful products I have found during the last month. (Please note that these are first-look reviews; I have not conducted exhaustive testing.)

BROADWAY

Broadway from Data Translation Inc. is a PCI-based MPEG-encoding board that uses CL 4110, a new MPEG-encoding processor from C-Cube. This processor enables Broadway to provide high-resolution video capture capabilities.

Broadway includes both S-video and composite inputs, as well as video capture software, which you can use to capture video clips. This software allows you to use a special softening filter to mask impurities if the video signal is unclear or if the video source is of poor quality. This software also allows you to adjust the following:

- Parameters such as the video data rate and the audio capture rate
- Attributes such as color intensity and contrast

In addition, Broadway includes a version of MediaStudio Pro from Ulead Systems Inc. Although this version offers limited functionality, you can use MediaStudio Pro to edit the video clips that you capture.

Because Broadway includes clear installation instructions and a quick reference card, you can install and learn to use Broadway quickly and easily. In fact, I installed Broadway and captured my first video clip in about 20 minutes. Broadway supports AVI and MPEG-1 file formats and NTSC and PAL video formats.

You can purchase Broadway at the suggested retail price of U.S. \$995. For more information about Broadway, visit Data Translation's World-Wide Web site (<http://www.b-way.com>). You can also call 1-800-249-1000 or 1-508-481-3700.

NUTS & BOLTS

Nuts & Bolts from Network Associates Inc. (a new company recently formed by the merger of McAfee, Network General, Helix,

and PGP) is a collection of desktop management and diagnostic utilities for Windows 98, Windows 95, and Windows 3.x workstations. With Nuts & Bolts, you can resolve hardware and software problems, eliminate hardware and software conflicts, optimize a workstation's hard drive, and prevent crashes. You can also repair corrupted files and secure and shred confidential files. (Nuts & Bolts "shreds" a confidential file by writing binary data over the original file so that this file cannot be read or recovered from the hard drive.)

Nuts & Bolts includes the following utilities:

- The Disk Minder utility helps you find and fix hard drive errors.
- The Disk Tune utility helps you defragment your workstation's hard drive.
- The Bomb Shelter utility helps you prevent your workstation from crashing by blocking invalid memory access. This utility also helps you recover when applications on your workstation crash.
- The Registry Wizard utility helps you rebuild the Windows registry, thereby reducing registry fragmentation and optimizing performance.
- The Clean Up utility helps you secure and shred confidential files, as well as eliminate duplicate files and unused files. This utility also helps you maximize hard drive space: You can archive files by compressing them into .ZIP files.
- The ZIP Manager utility helps you manage .ZIP files. For example, you can use this utility in conjunction with the Clean Up utility to compress files into .ZIP files.
- The WinGauge utility helps you monitor system memory and workstation resources, providing performance statistics and alerting you to potential hardware and software problems.
- The Image and Restore utility helps you create an image of your workstation's hard drive and restore this image later if the hard drive becomes corrupted. This utility also helps you create a floppy diskette that contains all of the tools you need to recover the workstation in an emergency.

Nuts & Bolts is available for Windows 98, Windows 95, and Windows 3.x. You can purchase Nuts & Bolts at the suggested retail price of U.S. \$54. For more information about Nuts & Bolts, visit Network Associates' web site (<http://www.nai.com>). You can also call 1-408-988-3832. ☎

STANDALONE GAME OF THE MONTH

Starship Titanic from The Digital Village is a quirky game based on a concept created by Douglas Adams, a popular science fiction author who wrote the cult classic *The Hitchhiker's Guide to the Galaxy*. In Starship Titanic, you assume the role of a character who is sitting at home in front of the television one night when a starship suddenly crashes into your living room. Although the house is pulverized, the starship sustains only minor damage, and both you and the spaceship's crew escape injury. You are invited aboard by one of the robots on the crew, who explains that the doomed starship is actu-

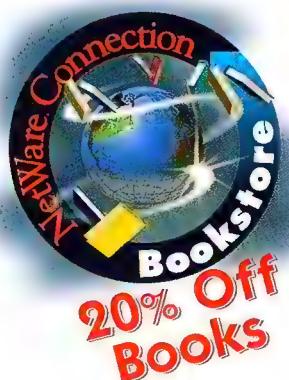
ally the Starship Titanic, which has malfunctioned on its maiden voyage.

As you explore the Starship Titanic, you discover that the crew is populated by a motley collection of robots and a deranged, talking parrot. (If you have ever read a Douglas Adams book, the crew will not surprise you.) Your goal is to find out how the Starship Titanic crashed by piecing together details you learn from the crew members. Using SpookiTalk, an interactive language interface, you can ask questions about the crash, and the crew members can respond to each question with one of more than 10,000 phrases.

At this point, the game takes another turn into Douglas Adams territory: After you solve the mystery behind the fate of the Starship Titanic, you must pilot the starship back to its port before the parrot's inane commentary drives you insane.

Starship Titanic is available for Windows 95. (A Macintosh version of the game should be available later this year.) You can purchase Starship Titanic through retail channels at the suggested retail price of U.S. \$49.95. For more information about Starship Titanic, visit the official Starship Titanic web site (<http://www.starshiptitanic.com>). You can also call +44-171-543-1700. ☎

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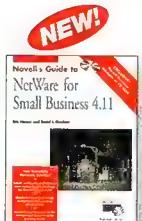


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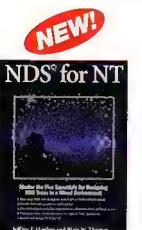


NOVELL'S CNE PRODUCT LINK

Now available for NetWare Connection subscribers, NUI members, and CNAs.
Price: \$59.95

ISBN: 0016

This set of CD-ROMs contains limited-user versions of Novell shipping, beta, and early-access release products such as NetWare 5. (CNEs must go to <http://cnenet.novell.com> for CNE discount.)



NDS for NT

Jeffrey F. Hughes and Blair W. Thomas
432pp
Retail Price: \$39.99
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ISBN: 45515

This book explains how to set up directory services on an intraNetWare and Windows NT network. It also discusses how NDS for NT eliminates the need to manage your company's network using Windows NT domains.



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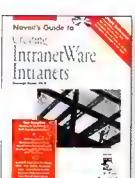
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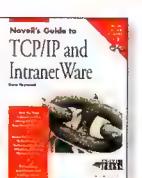
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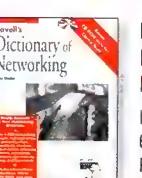
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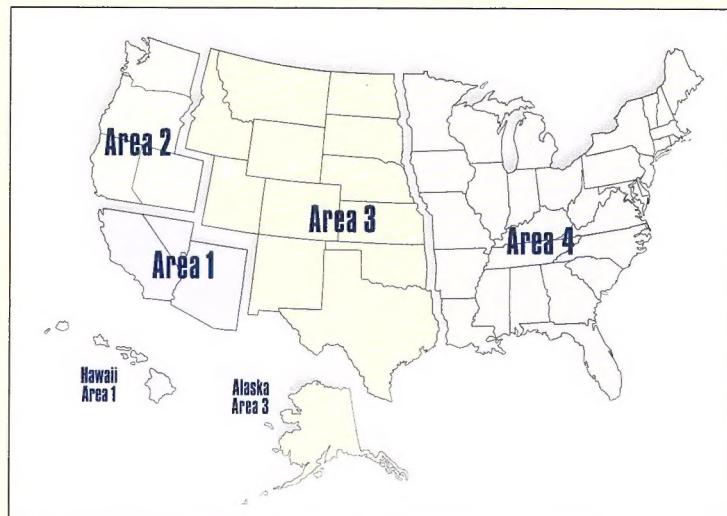
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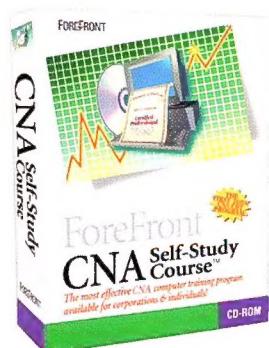
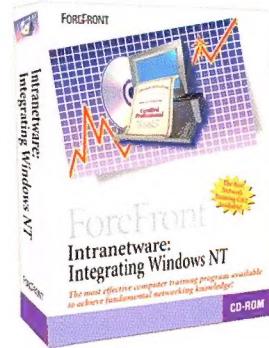
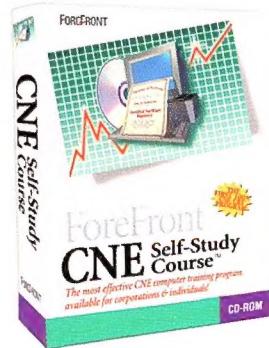
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